FORESTRY ABSTRACTS

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FORESTRY ABSTRACTS

VOLUME 3 1942 NUMBER 4

BALSA (*OCHROMA* SPP.)*

BOTANICAL IDENTITY AND NATURAL RANGE.

THE name Balsa, which is the Spanish for raft and indicates the original purpose for which the wood was used in Latin America, is applied to species of the genus *Ochroma* (Bombacaceae). These are common and conspicuous trees in tropical America, their range extending from the West Indies, through Central America, to the northern regions of South America [2, 3, 12, 22]. Up to 1919, when the genus was revised by W. W. Rowlee, only two species were recognized, viz. *O. tomentosa* Willd. from the upper Magdalena River in Colombia, and *O. lagopus* Sw. over the rest of the natural range of the genus. The latter was split by Rowlee into a number of species, those now distinguished [2, 7, 12, 22] being:—*O. lagopus* Sw. (*O. pyramidale* (Cav.) Urban), in the West Indies; *O. concolor*, Rowlee, in Guatemala, Honduras, British Honduras, Yucatan; *O. limonensis* Rowlee, in Costa Rica, Panama,? British Honduras; *O. grandiflora* Rowlee, in Ecuador; *O. velutina* Rowlee, on the Pacific Coast of Central America; *O. bicolor* Rowlee, in Costa Rica, British Honduras; *O. boliviana* Rowlee (probably including *O. peruviana* Johnston from Peru), in Bolivia; and *O. obtusa* Rowlee, in Colombia. Some botanists, however, are inclined to believe that too many species have been made, e.g. Standley and Record [14] doubt whether the Central American forms are really different from the original *O. lagopus* of the Greater Antilles, and according to Macbride [7] it seems probable that the number of recognized species will be reduced when the trees are better known. At all events, there is said to be no need to differentiate between the timbers of the several species, except for that of *O. tomentosa*, which is unmarketable and is not stocked in London [6]. Record and Mell [12] state that the woods of all the species are very much alike and apparently show no more variation than is the case within a species or even in various portions of a single old tree, though they quote Rowlee as saying that wood of *O. velutina* is harder and heavier than the others. According to Greenhouse [2, 3], over 90 per cent. of the world supply of Balsa wood is obtained from *O. grandiflora* in Ecuador, largely owing to exchange in that country being the most favourable to the U.S. dollar; the bulk of the exported Balsa is derived from the Guayaquil region.

UTILIZATION.

Now well known as the lightest timber in commerce, Balsa was an unfamiliar and unimportant wood before the war of 1914–18, when a shortage of cork brought it into prominence for many purposes where lightness and buoyancy or heat-insulating properties are required [2, 6, 12]. Though it may be considerably lighter than cork, its specific gravity [12, 15, 17, 22] varies between 0·05 and 0·41, the mean value being about 0·14; this represents the greatest known range of specific gravity for any wood. Second-growth Balsa from British Honduras has been found to vary in weight within the same stem from 7½ lb. per cu. ft. at the centre of the log to 21½ lb. per cu. ft. near the circumference; another log, however, varied less, the values for the inner and outer wood being 6·8 and 10·8 lb., respectively [16, 19]. In the trade the usual range is said to be 8–14 lb. per cu. ft., with an average of 10 lb. per cu. ft. [3], but it is believed that lower densities are specified for some purposes. Quality requirements for commercial Balsa are exacting: only the best wood, consisting of knot-free lengths from the bole, are accepted; in addition, waste in conversion amounts to more than 50 per cent. [2, 3, 17]. The wood is comparatively strong for its weight, is easy to work provided that tools are kept very sharp to prevent the fibres tearing out, has a low thermal conductivity, and is very perishable, being said to decay as quickly as cotton fabric if left in the woods [3, 6, 12, 17, 19, 22].

* The material contained in this note was compiled originally in answer to enquiries on this genus, and is published here in order to make the information generally available in one source.

Until seasoned it is liable to develop severe splits; air drying is unsatisfactory, and even kiln drying demands much care to avoid splitting, warping, and case-hardening. Logging and milling processes must therefore take place as speedily as possible in order to reduce fungus damage, borer attack, and the development of physical defects to a minimum [3, 17, 22]. The converted timber has to be treated to prevent decay and troubles arising from shrinkage and swelling; for this purpose special methods of impregnation with paraffin are employed. This treatment is said to raise the specific gravity but little and to render the wood more readily workable [12, 13, 22]. Data on the anatomy of the wood are to be found in references [12] and [22].

Balsa wood has been used extensively for lifebelts, floats for fishing nets and mines, parts of lifeboats, hydroplane floats, streamlining of struts and braces in aeroplanes, and heat insulation in refrigerators and packing cases for perishable foodstuffs; also as packing for armour plate in battleships, for sound-proofing, and as a vibration insulator for machinery [6, 12, 15, 17, 19, 21, 22]. It has also been suggested as a material for large loud-speaker diaphragms [1]. Milling waste is of no value for steam generation, and efforts to develop a market for hogged waste as an insulating material were unsuccessful [3, 17]. The bark is reported to be worthless as a source of tannins [11].

Pulping experiments with Balsa wood have met with fair success. A log from British Honduras, tested at the Imperial Institute, had an outer layer of comparatively hard and heavy wood, which proved very suitable for papermaking, and a much softer and lighter core, which was less satisfactory for pulping. It was concluded that pulp made from whole logs of Balsa would be fairly satisfactory, unbleached material being suitable for strong wrapping paper and bleached material for a white paper of reasonable quality, but that the utility of the wood would depend to some extent upon the proportions of hard and soft wood present [20]. A German publication [22] reports that good, readily bleached paper pulp has been made from Balsa, the yield being 45–50 per cent., and that the strength properties of the resulting paper are materially improved by mild cooking and bleaching conditions designed to retain the parenchyma fraction of the wood.

A subsidiary product of the Balsa tree is the seed floss, which is used locally for stuffing mattresses, pillows, and upholstery and for which a local market exists in British Honduras; there is, however, no demand for the floss in the textile industry, probably because of its short staple [16, 17, 22].

Regeneration and Silviculture.

Within its natural range Balsa is reported to occur most commonly in the lowlands and foothills, though seldom, if ever, on soils that are at all affected by brackish or salt water. It has not been found at altitudes over 1,000 m. above sea level [12]. In Costa Rica exploitable Balsa occurs only up to about 150 m. elevation [10]. Though scattered trees exist in virgin forest, the species are characteristically trees of second-growth types, often appearing promptly and abundantly where clearings have been made by natural agencies or human cultivation [10, 12, 16, 17]. On farm land, Balsa can be a troublesome weed, and the best commercial stands are said to occur in Ecuador on abandoned fields [3]. It requires a rich soil, high temperatures, and plenty of moisture, but good drainage is essential as the trees will not tolerate waterlogging [2, 3, 16, 17]. On the Hacienda Lata, in Ecuador, it was definitely established that Balsa would not succeed in pure stands on a slope or survive at all where drainage was poor [2]. Meteorological data are extremely scanty: for the Hacienda Lata lands, which lie at elevations of 100–200 ft. above sea level on alluvial clayey loam soil, it is stated that the temperature varies from 66° to 95° F. and the rainfall is extremely high, especially from January to June [2]; the Balsa habitats on the Atlantic Coast of Costa Rica have a moist, hot climate, with a rainfall of 3,000 mm. (118 in.), a mean temperature of 27° C. (80° F.), and no entirely rainless season [10]. In keeping with its pioneering character, Balsa is an extreme light demander and produces copious seed adapted to wind dispersal. The fruit resembles a large cotton boll when ripe, being filled with a silky floss that envelops the numerous seeds, which are like small grape pips; each pod may contain up to 400 seeds, and a tree is capable of producing several hundred thousand seeds yearly [3, 10, 12, 17, 22]. Holdridge [5] has described a quick method of cleaning the seed by placing the floss on a $\frac{1}{8}$-in.-mesh sieve and setting fire to it, the seeds dropping through into a pan of water about 2 in. below. Stevenson [16] gives an account of a simple, home-made separating machine that consists essentially of a $\frac{1}{4}$-in.-mesh cylindrical screen through which runs a rotating shaft carrying pegs for agitating the mass; this method yielded 17 large bags of floss and over 40 lb. of seed from 10 large bags of pods, whereas when the floss was put in bags, beaten with sticks, and then

raked or winnowed away from the seed, the yields were 12 large bags of floss and 22·3 lb. of seed from 11 large bags of pods. There are about 45,800 seeds to the pound [10, 16]. Collection of pods for seed should be done on wet days or in the early morning, otherwise they burst and most of the seed may be lost; after collection they may be placed in trays covered with netting and sunned to cause them to open [16].

When preparing land for Balsa cultivation it is necessary, owing to the intolerance of the species, to clear all forest cover [2]. In Costa Rica the site is cleared and burnt over in January and February [17]; for Ecuador it is recommended that clearing should be started as soon as possible in the dry season, but not before the rains have definitely ceased [2]. Burning is said to be essential, and for Ecuador and British Honduras an intensive burn of all slash is advocated [2, 16, 17]. In the last-named country experiments made on unburnt land, though giving promising reproduction, all failed, and seedlings did not thrive beyond a height of 1½–2 in. except in prepared nursery beds [16]. Burning stimulates the germination of Balsa and favours its development against that of other second-growth species [2, 5, 16].

Planting appears to have been the method of stand formation used in Costa Rica, at least prior to 1928; the plants were spaced 20 × 20 [in.?], wider spacing being said to give branchy and therefore knotty trees, and closer spacing to produce spindly ones [17]. The young plants, however, are very delicate and fragile, and experience in Ecuador and British Honduras is against this method. On the Hacienda Lata in Ecuador all transplanted stock failed, whether put out in the ordinary manner or grown in and planted out complete with special bamboo pots, and planting was then abandoned [2]. For British Honduras it is stated that direct sowing would be the only practicable method of artificial regeneration, though planting had more success here, as it is said that transplanted stock showed slightly better growth at the end of 5 years than did natural regeneration [16]. Nevermann [10], on the other hand, reports that even in Costa Rica planted trees grow more slowly than wild ones.

Sowing at stake was tried with partial success in Ecuador, but was too expensive and produced overcrowded patches of mainly spindly trees that were overturned by the first heavy wind; the few outside trees were sturdier but crooked and branchy owing to improper shading. Direct sowing appears to have been abandoned, except for filling blanks [2]. In British Honduras results obtained with natural regeneration indicate that the correct method would be to broadcast the seed after clearing and burning; patch burning and sowing has not shown much success, probably on account of side shade from fast-growing second-growth vegetation around the patches [16].

Artificial regeneration is avoided in British Honduras and Ecuador whenever possible, and advantage is taken of the abundant natural regeneration of which the tree is capable. Stevenson [16] states that the seed can lie dormant in or on the soil for at least 3½ months under second growth and responds at once by germinating when the cover is cut and burnt. Greenhouse [2] says that the seed must receive direct sunlight in order to germinate; that he has seen seeds germinate and grow after they had been kept for seven years without special care; and that owing to their capacity for dormancy they accumulate in the jungle soil in vast numbers, thus assuring plentiful reproduction. On clean ground the seed takes only 8–10 days to germinate [17]. Greenhouse's recommendations are that site clearance should begin early in the dry season, so that the seedlings will be at least 3 ft. high (30-45 days) before the first rains, thus avoiding damping off; and that all Balsa trees on the site should be left for seed dispersal, together with about 2 trees per acre of other species to serve as spar trees for cable logging [2]. Stevenson states that Balsa gives excellent natural regeneration following burning either at seeding time (late April or early May in British Honduras) or up to 3½ months afterwards, and possibly longer [16].

In tending operations the essential point is to guard against damage to the very fragile seedlings. Until these are 6 months old and about 1½ in. in diameter, they are said to be little more than pith and cortex, and even slight injuries often cause death [2, 17]. They are damaged by wind, insects, and disease, but natural regeneration is often so plentiful that sufficient trees survive by sheer weight of numbers, and the chief cause of damage is the careless workman; even older trees will develop hard, dense wood and thus lose their commercial value after slight wounding [2, 3]. From British Honduras it has recently been reported that an experimental Balsa plantation, then nearing maturity, was completely wrecked by a hurricane, the trees being snapped off half-way up the bole and salvage being impossible.

In Costa Rican plantings it was necessary to clear the bush around the plants up to about 2 years, when they outstripped the weeds and vines [17]. According to Greenhouse [2], Balsa is comparatively slow-growing and shade-tolerant in the first 3–4 months, but as the rate of growth increases, between 3 and 6 months of age, the seedlings become intolerant and the stand should be weeded to remove all but the best Balsa plants, which are left at about 4 ft. apart. Broadcast sowing of blanks can be combined with this operation. Stevenson [16] believes that with dense regeneration no cleaning is likely to be needed, and has seen small areas of uncleaned natural regeneration where Balsa has established itself against all other species. He is also of the opinion that thinnings would be required after the first year to prevent overcrowding and the development of tall, spindly stems. On the other hand, Greenhouse states that owing to the insistence of the lumber market on clear logs, more emphasis must be placed on height than on diameter growth, and recommends that after the combined weeding-and-spacing operation the stand should be left untouched until maturity, as any further work would be deleterious owing to the carelessness of the workmen.

It may be noted in passing that experience in British Honduras indicates that large quantities of seed floss cannot be obtained annually from plantations managed for timber production. Experiments have been started to determine whether open-grown trees can be topped to produce low-branching crowns from which the pods could be picked without felling the trees. Results to date show that saplings 4–6 in. in girth can be cut at about 4 ft. from the ground and will produce many branches. Periodical lopping would probably be required to keep the crown within reach [16].

Growth and Yield.

Available figures for growth and yield are scanty and show much divergence, though it is evident that growth is extremely rapid, particularly during the first few years of life. In Ecuador [2, 3] the trees may reach 10–12 ft. in height and 1½ in. in diameter at 6 months of age, and 1-year-old trees may be over 15 ft. high and 2–2½ in. in diameter; exploitable size is attained in about 10 years at heights of 60–90 ft. and diameters of 30–45 in. above the butt swelling; after 8 years of age the trees develop a light pink heartwood, which is not a serious defect, but at 12–15 years the heartwood becomes watersoaked and doty, the rate of growth declines, and the wood grown from then on is generally very hard. In British Honduras [16] the height of 1-year-old trees is said to be about 10 ft.; in 5 years some transplanted stock reached a mean diameter of about 11·9 in. and had an average clear bole of 12 ft. Costa Rican trees [17] reach heights of 52–66 ft. and diameters of 23–30 in. in 5–6 years, with an average diameter increment of 4·7–5·9 in. annually; maximum size may be attained in 10 years, but wood of this age would be valueless in commerce since lightness is essential and the wood becomes denser as the tree ages; in this country commercial Balsa comes mostly from fast-grown, 4- to 6-year-old trees. According to Nevermann [10] growth varies with site and plantation trees are slower-growing than wild ones, e.g. in a Costa Rican plantation, trees initially spaced 13 ft. apart and thinned to twice this spacing mostly reached diameters of only 12 in. after 6 years; this point is important, as the faster the growth the lighter is the wood. Tenny [17] states that in Costa Rica the yield varies greatly; merchantable timber to the extent of 5,000 bd. ft. per acre would be considered an especially fine yield, 2,500 bd. ft. per acre would be a fair average, and many plantations have failed to yield more than 1,200 bd. ft. per acre.

Balsa has been introduced into Java and appears to be making phenomenal growth there; data from experimental sample plots [4] are as follows:—Height increment about 26 ft. in the first year, 16 ft. in the second, 13 ft. annually in the third to fifth, and 6½ ft. annually from the sixth to tenth years; a mean stand height of 98 ft. is reached in 7 years. Mean diameters of 12 in. and 20 in. are reached at 6 and ±17 years respectively. Basal area per acre is about 109 sq. ft. at 7 years. The number of stems per acre drops sharply from about 500 at the start to 300 at 2 years and 140 at 5 years. A 4-year-old stand had a timber volume (after thinning) of 13,700 bd. ft. per acre, and the volume at 10 and 15 years is about 35,700 and 44,600 bd. ft. per acre, respectively. The wide discrepancy between these and the Costa Rican figures is possibly attributable to the enormous waste in the forest and at the mills under commercial conditions in the latter country. In British North Borneo [23] an experimental plantation derived from Guatemalan seed reached a mean height of 34 ft. at 7 years from planting, 35 ft. at 8 years (after thinning), and 39·6 ft. with a mean diameter of 11·3 in. at 9 years.

Balsa is said to have been successful in the Cameroons [22]. In India, it was tried at Dehra Dun in 1921 and 1922, but both lots of plants died in November–December, when night temperatures

drop to about 40° F. [18]. In Ceylon, small-scale trials in the wet country from sea level to 100 ft., with a rainfall of 75–125 in., have failed, though the species is said to have been raised successfully on private land [8]. The growth of a few trees raised in 1920 on a private estate in South Africa was disappointing [18]. Finally, it appears from two papers on insect pests [9] that the Japanese have introduced Balsa into Formosa, but nothing further is known of their success or otherwise.

LITERATURE CITED

[1] GARMAN, H. G. The use of Balsa wood in the reproduction of tone frequencies. *Trop. Woods* No. 14, 1928 (31–2).
[2] GREENHOUSE, S. The culture of the Balsa tree in Ecuador. *J. For.* 33, 1935 (870–6).
[3] —— Balsa wood: its growth and manufacture. *Wood Products* 46 (9), 1941 (16–8, 41–2).
[4] HELLINGA, G. Vergelijking tusschen opbrengstgegevens van eenige Nederlandsch Indische en Europeesche houtsoorten. [Comparison of yield data for some Dutch East Indian and European timber species.] *Tectona* 31, 1938 (791–801). [Du.e.]
[5] HOLDRIDGE, L. R. A rapid method of extracting Balsa seed. *Carib. For.* 1 (2), 1940 (25). [E.span.]
[6] HOWARD, A. L. A manual of timbers of the world, their characteristics and uses. Macmillan & Co., Ltd., London. 1934. pp. 45–6.
[7] MACBRIDE, J. F. Identity of the Peruvian Balsa. *Trop. Woods* No. 17, 1929 (5–7).
[8] MCNEILL, W. M. Notes on exotic forest trees in Ceylon. Govt. Record Office, Colombo. 1935. p. 2.
[9] MITONO, T. A longicorn beetle destructive to Balsa tree. *Taiwan no Sanrin* No. 162, 1939 (1–8). Insect pests feeding on the leaves of Balsa. *Taiwan no Sanrin* No. 166, 1940 (11–8). [Jap.] [Cf. *For. Abs.* 3 (83–4).]
[10] NEVERMANN, F. Das Balsaholz. [Balsa wood.] *Tropenpflanzer* 25, 1922 (49–52). [G.]
[11] RECORD, S. J. Chemical analysis of Balsa bark. *Trop. Woods* No. 2, 1925 (1).
[12] —— and MELL, C. D. Timbers of tropical America. Yale University Press, New Haven, Conn. 1924. pp. 424–6.
[13] SPOON, W., and SESSELER, W. M. Drijfvermogen van met paraffine geconseveerd balsa-hout. [Buoyancy of Balsa wood treated with paraffin.] *De Indische Mercuur* 62, 1939 (289 *et seq.*). [Du.e.]; *Berichten van de Afdeeling Handelsmuseum van de Kon. Vereeniging Koloniaal Instituut* No. 135. pp. 18.
[14] STANDLEY, P. C., and RECORD, S. J. The forests and flora of British Honduras. *Publ. Field Mus. nat. Hist.* No. 350 [*Bot. Ser.* Vol. 12], 1936.
[15] STANG, A. H. Compressive tests on Balsa wood. *Trop. Woods* No. 14, 1928 (12–5).
[16] STEVENSON, N. S. Balsa in British Honduras. *Carib. For.* 1 (3), 1940 (1–3). [E.span.]
[17] TENNY, F. A. Costa Rican Balsa. *Unifruitco, Boston* 4 (1), [1928] (3–5); *abstr.* in *Trop. Woods* No. 15, 1928 (34–7).
[18] TROUP, R. S. Exotic forest trees in the British Empire. Oxford University Press. 1932. p. 167.
[19] Balsa wood from British Honduras. *Bull. imp. Inst., Lond.* 23, 1925 (4–8).
[20] Some British Honduras woods as papermaking materials. *Bull. imp. Inst., Lond.* 23, 1925 (12–7).
[21] Balsa boxes carry perishables safely. *Sth. Lumberm.* Apr. 18, 1925 (44); *abstr.* in *Trop. Woods* No. 4, 1925 (25–6).
[22] Balsa, *Ochroma spec. Merkblätter über Koloniale Nutzhölzer, Tharandt* No. 12, [1940?]. pp. 14.
[23] Annual Reports of the Forest Department, British North Borneo, for 1930–35. Sandakan. 1931–36.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages.

The term "billion" used in papers originating in North America means a thousand million.

0. GENERAL FORESTRY

01. BIBLIOGRAPHY

01.6 : 7 : 09.4 : 2 : 3 : 4 : 6 : 8 : 9 (73). NELSON, A. Z. **A selected bibliography on the economics of forestry in the United States.** U.S.D.A. Forest Service, Washington, D.C. 1941. pp. 172.

05.3 *Annual Reports*

05.3 (51). HONG KONG. **Annual report of the Superintendent, Botanical & Forestry Department, for the year 1940–41.** Govt. Printer, Hong Kong. 1941. pp. 7.

05.3 (54.1) : 2. BENGAL. **Annual report on silvicultural research in the Presidency of Bengal for the year 1940–41.** Govt. Branch Press, Darjeeling. 1941. pp. 14 + 68.

05.3 (54.2). ORISSA. **Annual progress report on silvicultural research, utilization and working plans for the year 1939–40.** Govt. Press, Cuttack. 1940. pp. 13.

05.3 (54.3). CENTRAL PROVINCES & BERAR. **Annual report on forest utilization for the year ending 31st March, 1941.** Govt. Printing, Nagpur. 1941. pp. 21.

05.3 (54.8). MADRAS. **Administration report of the Forest Department of the Madras Province for the year ending 31st March, 1940.** Volumes I & II. Supt., Govt. Press, Madras. 1940. pp. 105.

05.3 (54.87). CEYLON. **Administration report of the Conservator of Forests for 1940.** Govt. Record Office, Colombo. 1941. pp. 7.

05.3 (59.5 : 91.1). MALAYA AND BRUNEI. **Annual report on forest administration in Malaya, including Brunei, for the year 1940.** Govt. Printer, Kuala Lumpur. 1941. pp. 22.

05.3 (68.2) : 33.36.1 : 33.51. TRANSVAAL. **Transvaal Chamber of Mines Timber Research Laboratory annual report, 1940.** Johannesburg. 1941. pp. 22.

05.3 (69). MAURITIUS. **Annual report of the Forest Department, 1940.** Govt. Printer, Port Louis. 1941. pp. 10.

05.3 (71.21). MANITOBA. **Annual report of the Forest Service, fiscal year ending April 30th, 1941.** Department of Mines & Natural Resources, Manitoba. 1941. pp. 14–29.

05.3 (73) : 11.62.11. UNITED STATES. **Report of the Chief of the Soil Conservation Service, 1940.** Supt. of Documents, Washington, D.C. 1940. pp. 64.

05.3 (75.1). DELAWARE. **Annual report of the State Forester to the State Forestry Commission for the fiscal year (July 1, 1940, to June 30, 1941).** State Forestry Dept., Dover, Del. 1941. pp. 45.

05.3 (79.5). OREGON. **Biennial report of the State Forester to the Governor for the biennium of 1939–40.** Salem, Ore. [1941?] pp. 59.

05.3 (931) : 92 : 43.1 : 23.1 : 44.3 : 31.0. NEW ZEALAND. **State Forest Service. Annual report of the Director of Forestry for the year ended 31st March, 1941.** Govt. Printer, Wellington. 1941. pp. 50.

05.3 (94) : 33.8 : 12.25 : 31.0 : 33.36.1. AUSTRALIA. **Council for Scientific and Industrial Research. Division of Forest Products. Annual Report for 1940–41.** [Melbourne. 1941?]. pp. 10.

05.3 (941). WESTERN AUSTRALIA. **Report on the operations of the Forests Department for the year ended 30th June, 1941.** Govt. Printer, Perth. 1941. pp. 20.

05.3 (943). QUEENSLAND. **Annual report of the Sub-Department of Forestry for the year 1940–41.** Govt. Printer, Brisbane. [1941]. pp. 8.

07. EDUCATION AND RESEARCH

07.2. HOWARD, S. H. **Forest research and war.** *Emp. For. J.* 20, 1941 (162–4).

A brief review is given of the war-time policy of the Forest Research Institute, Dehra Dun, and of the work of the various branches of the Institute on war problems. Its activities are being concentrated on research and the giving of information on supplies of forest products, but it is not itself a supply unit.

07.6 (74.7). PRICHARD, R. P. **Report on experimental planting, Syracuse Forest Experiment Station.** *Tech. Publ. N.Y. St. Coll. For.* No. 57, 1941. pp. 43.

09.4. *Forest Statistics*

09.4 (410) : 98.3. WATSON, SIR H. **Imports of timber into the United Kingdom.** *Emp. For. J.* 20, 1941 (165–70).

Figures for imports during 1939 are analysed and compared with those for previous years.

09.4 (45) : 98 : 23.3. PAVARI, A. Die Selbstversorgung Italiens auf forstwirtschaftlichem Gebiete und die Erfolge der faschistischen Aufforstung. **[Italy's self-sufficiency in the sphere of forestry and the success of fascist afforestation.]** *Thar. forstl. Jb.* 91, 1940 (717–34); *abstr.* in *Holz* 4, 1941 (262–3). [G.] P.R.

Italy has 6,065,000 ha. of forest, of which 1,155,000 ha. are coniferous; 666,000 ha. are hardwoods and mixed forest; 3,350,000 ha. are coppice and coppice with standards; 532,000 ha. are Spanish Chestnut groves; and 362,000 ha. are derelict forest and scrub. The annual outturn during 1930–34 was about 2 million cu. m., and annual imports over the same period were about 3·5 million cu. m., of which up to 94 per cent. was softwood. In 1934 annual increment was estimated at 2·8 million cu. m. During 1937–38 the cut was raised to 3·5 million cu. m., and imports, including pulp expressed as cu. m. of wood, restricted to 1·5 million cu. m. Timber production could be increased over wide areas. Between 1927 and 1937 the Milizia Forestale afforested 85,000 ha. and carried out forest improvement work on 350,000 ha. In 1937 and 1938, 50,000 ha. were afforested or improved.

09.4 (492) : 98. Forst- und Holzwirtschaft in den Niederlanden. **[Forestry and the timber trade in Holland.]** *Int. Holzmarkt* 1941 (5/6); *abstr.* in *Holz* 4, 1941 (261). [G.] P.R.

A collective abstract of a whole series of articles in this number of *Internationaler Holzmarkt*. The forest land of Holland amounts to 258,000 ha., or 8 per cent. of the total land area; only a small portion of this is under sustained-yield management. There are 162,000 ha. of coniferous forest, 22,000 ha. of hardwood high forest, 61,000 ha. of coppice, and 11,000 ha. of Willow holts. The outturn is about 600,000 cu. m. The principal tree species are Pine, Oak, Beech, Poplar, and Elm. Wood imports in 1939 were distributed as follows:—Spruce, Fir, and Pine saw timber for building construction and box manufacture 1,860,000 cu. m.; round sawlogs 75,000 cu. m.; piles 79,000 cu. m.; telegraph poles 18,000 cu. m.; pitwood 209,000 cu. m.; pulpwood 470,000 cu. m.; and sleepers 41,000 cu. m.

09.4 (404). Statistique forestière suisse 1939. **[Forestry statistics for Switzerland, 1939.]** *J. for. suisse* 92, 1941 (223–6). [F.]

09.4 (67.11) : 98.3. NOSTI, J. Panorama económico agrícola de nuestras colonias de Guinea. **[Notes on the rural economy of the Spanish Guinea colonies.]** *Agricultura, Madrid* 10, 1941 (421–6). [Span.] A.P.B.

Timber exports from Continental Guinea during 1930–39 were as follows (in metric tons).

	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
Okoumé (*Aucoumea klaineana*) .	31,802	37,207	54,702	42,773	87,522	89,118	68,646	44,702	57,290	31,665
Other species	22	170	287	671	902	6,707	7,627	4,966	13,354	31,867

The metropolitan demand for colonial timbers is almost unlimited. Forest exploitations in Continental Guinea cover 103,000 ha., of which 32,000 ha. are now practically depleted of useful timber.

09.4 (71) : 33.32. CANADA. **The pulp and paper industry, 1938–1939.** Dominion Bureau of Statistics, Ottawa. 1941. pp. 110. [E.F.]

A historical note on the pulp and paper industry in Canada, together with detailed statistics of the industry for 1938–39.

09.4 (71.3–7) : 33.17. **Sawmills of eastern Canada, 1940.** Lands, Parks & Forests Branch, Department of Mines & Resources, Ottawa. 1941. pp. 22 + separate map.

09.4 (71.1–21) : 33.17. **Sawmills of western Canada, 1940.** Lands, Parks & Forests Branch, Department of Mines & Resources, Ottawa. 1941. pp. 6 + separate map.

Sawmills are listed by provinces and annual production, and their location is shown on two large-scale maps.

09.4 (73) : 33.32. AWALT, F. H., and FROST, B. M. **The United States pulp and paper industry September-October, 1941.** *Industr. Ref. Serv. U.S. Dep. Comm.* Pt. 4. *Forest Products, Issue* No. 7, No. 43, 1941. pp. 16.

09.4 (73) : 98. MULLER, J. L., and SLIFKO, C. **The United States lumber industry, October 1941.** *Ind. Ref. Serv. U.S. Dep. Comm.* Pt. 4. *For. Prod.*, No. 7, 1941. pp. 22.

09.4 (73) : 98. **The United States lumber industry. Report of Lumber Survey Committee.** *Timber of Canada* 2 (1), 1941 (118, 120, 122, 124).

09.4 (73) : 98 : 97.4 : 91.7–8 : 12.25. **The Douglas Fir lumber industry.** Bureau of Research and Statistics, Advisory Commission to the Council of National Defense, Washington, D.C. 1941. pp. 98.

A detailed study of the industry is discussed under (1) relationship of production, sales, prices, and wages, (2) financial history, (3) employment and payrolls, (4) wages, (5) Douglas Fir prices, and (6) military and civilian requirements of lumber in 1941 and 1942.

09.4 (74.8) : 60.31.2 : 97.2. HEBB, H. C. **Some highlights on farm woodlands in western Pennsylvania.** *J. For.* 39, 1941 (952–3). [U.S. Forest Service.]

Data on land classification and timber volumes obtained from a recent survey of farm woodland in western Pennsylvania. Under extensive forest management the area could support an annual cut of 5 million bd. ft. indefinitely.

09.4 (79.4) : 98 : 97.4 : 91.7–8. CRAFTS, E. C. **Some economic facts about the California lumber and timber products industry and size of its dependent population.** *Tech. Note Calif. For. & Range Exp. Sta.* No. 17, 1941. pp. 18.

09.4 (79.5 : 79.7) : 12.25 : 56. BRIEGLEB, P. A. **Forest growth in the Ponderosa Pine region of Oregon and Washington.** *For. Surv. Rep. Pacif. Nthwest. For. & Range Exp. Sta.* No. 78, 1940. pp. 51.

09.4 (79.5 : 79.7) : 98.1. JOHNSON, H. M. **Production of lumber, shingles and lath in Washington and Oregon, 1869–1939.** *Products Pap. Pacif. Nthwest. For. & Range Exp. Sta.* No. 1, 1941. pp. 2 + tbls. & gph.

09.4 (79.5 : 79.7) : 98.1. JOHNSON, H. M. **Production of logs in Washington and Oregon, 1925-1940.** *Products Pap. Pacif. Nthwest. For. & Range Exp. Sta.* No. 2, 1941. pp. 4 + tbls.

09.7. *Monographs of Individual Forest Regions*

09.7 (43.7) : 09.4 : 98. GONDA, P. Die Forst- und Holzwirtschaft der Slowakei. **[The forestry and timber trade of Slovakia.]** *Z. Weltforstwirt.* 8, 1941 (427–52). [G.e.] P.R.

09.7 (43.8). HESMER, H. Der Wald im Weichsel- und Wartheraum. **[The forests of the Vistula and Warta region.]** *Forstarchiv* 17, 1941 (171–207, 219–56). [G.] [Institut für Waldbau und Waldkunde (Möllerinstitut) der Forstlichen Hochschule Eberswalde.]

Data on forests and forestry in Western Poland are summarized under the following principal headings:—soil and climate; natural regional distribution of tree species; past deforestation, percentage area of forests, percentage of tree species by regions, forest ownership, and afforestation; general condition of the forests; silvicultural treatment of the chief tree species; and classification of forest regions. 181 references are quoted.

09.7 (43.8) : 99. **Documents relating to the administration of occupied countries in eastern Europe. No. 1. The German exploitation of Polish forests.** Polish Information Center, 151 East 67th Street, New York. 1941. pp. 19.

09.7 (66.9). SMITH, J. **Forests and forestry in the Cameroons. An introduction.** *Farm & Forest* 2, 1941 (62–8).

The topography and related distribution of the principal forest types and their species composition are described briefly. Forest land is used largely for farming and while forest produce is used extensively by the local people there is little exploitation for timber, although a certain amount of commercial timber (*Entandrophragma, Triplochiton, Chlorophora* and

Lophira) has been exported during the past ten years. Local trades in forest produce include that of *Saccoglottis gabunensis* bark for flavouring palm oil, of camwood from *Pterocarpus tinctorius*, of *Canarium* or *Cordia* wood for stool making, of *Carapa* wood for gun stocks and staves, and of *Pterocarpus* wood for canoe manufacture. Since the inception of the Cameroons Circle in 1929, about 12 per cent. of the forest in the Province has been reserved while about 21 per cent. is proposed for reservation in order to ensure adequate supplies of forest products and to provide protection. Afforestation has been limited to 250 acres of fuelwood plantations started in 1930 and composed of exotics such as *Eucalyptus robusta*, *E. rostrata*, *E. maidenii* and *Cupressus macrocarpa*.

09.7 (71.5) : 09.4. BROWN, K. B. **Forests and forestry in New Brunswick.** *For. Chron.* 17, 1941 (139–46). [Department of Lands & Mines, Fredericton, N.B.]

Of the 21,800 sq. miles of productive forest land in New Brunswick, 50 per cent. is administered by the Province, 30 per cent. is in farm woodlots and 20 per cent. is otherwise privately owned by individuals or corporations. In this paper a brief outline is given of the history, administration, management, and protection of the forests of New Brunswick together with notes on game conservation, forest industries, education, and research. The value of the pulp and paper products from this province averaged $15,000,000 for the three years 1939–41. Forest production on a sustained-yield basis is aimed at, and, as natural reproduction is rapid and plentiful, the first and most important factor in accomplishing this object has been the efficient protection of the forests against fire and other destructive agencies.

09.7 (79.5) : 60.31 : 90. KEPHART, G. S. **Forestry on the Klamath Indian Reservation.** *J. For.* 39, 1941 (896–9). [Klamath Indian Agency.]

Timber on the Klamath Indian Reservation in Oregon, mostly Ponderosa Pine, is sold by units under contract, usually to the highest bidder. All trees to be cut are selected and marked according to rules based on Keen's tree classification for Ponderosa Pine. On the average about 69 per cent. of the merchantable Ponderosa Pine are removed at present, leaving a reserve stand of some 3,900 bd. ft. of timbered acre.

09.7 (87) : 12.19. WILLIAMS, L. **Forests of the Venezuelan Guiana.** *Trop. Woods* No. 68, 1941 (13–40). [Field Museum of Natural History.]

A general descriptive account of the forests seen during travels in this region.

09.7 (946) : 09.4. D'ALTON, T. D. **Tasmanian forestry and timber industry.** *Aust. Timb. J.* 7, 1940–41 (403, 425).

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.1. *Atmosphere*

11.14. Precipitations. Evaporation. Humidity

11.14.3 (66.9). WEST, J. **A note on recent Nigerian rainfall records.** *Farm & Forest* 2, 1941 (30–1).

Analysis of these records indicates that many parts of Nigeria have been experiencing a period of sub-normal rainfall since 1935.

11.14.3 (68.7) : 11.62. WICHT, C. L. **A preliminary account of rainfall in Jonkershoek.** *Repr.* from *Trans. R. Soc. S. Afr.* 28, 1940 (161–73).

An intensive study of rainfall is being conducted in connexion with forest hydrological research at the Jonkershoek Research Station, 5 miles to the south-east of Stellenbosch. The greater portion of the paper is devoted to a preliminary analysis of the data on total annual precipitation, monthly and seasonal distribution of the precipitation, and intensity and duration of showers. *From author's summary.*

11.14.4 : 11.14.2 : 11.13. LAMPADIUS, G. Nebelfrostablagerungen sowie Tau- und Nebelniederschlag. Versuch einer grundsätzlichen Begriffsgliederung. Zugleich eine Besprechung von I. RINK: 'Die Schmelzwassermengen der Nebelfrostablagerungen'. Berlin, 1938. **[Frozen mist deposits and precipitation derived from dew and mist; an attempt at a fundamental classification of concepts: with a concurrent review of I. Rink's 'The quantities of water derived from the melting of frozen mist deposits'. Berlin 1938.]** *Thar. forstl. Jb.* 92, 1941 (545–84). [G.g.] [Sächsische Forstliche Versuchsanstalt.]

11.4. *Soil*

11.4. Entwurf für eine Anweisung zur Entnahme von Bodenproben im Walde. [**Draft of directions for the taking of soil samples in the forest.**] *Forstwiss. Cbl.* 63, 1941 (161–3). [G.] [Institut für Bodenkunde und Standortslehre der Bayer. Forstl. Versuchsanstalt.]

Tentative general directions based chiefly on the experience of the forestry institutes of Tharandt and Munich are presented for discussion in connexion with the intended preparation of a German standard specification for the taking of soil samples.

11.41. Soil Physics

11.41. LUTZ, H. J. **Soil analyses significant in forest soils investigations and methods of determination: 2. Measurement of certain physical properties of forest soils.** [With brief discussion.] *Proc. Soil Sci. Soc. Amer. 1940* 5, 1941 (350–1). [School of Forestry, Yale University.] H.S.B.

Soils that are comparatively free from stones are sampled with steel cylinders 10 cm. high and having a capacity of 1 litre. A filter paper is placed over the lower end of the cylinder, and the sample is set in a tank into which water is introduced at intervals of 1 hour so that it stands successively at $\frac{1}{3}$, $\frac{2}{3}$ and the full height of the cylinder. The sample then remains in the water for 24–48 hours, when it is weighed under water by means of a specific-gravity balance. After weighing, it is removed and allowed to drain on sandy soil material, being covered in the meantime with a moist cloth to prevent evaporation losses. When drainage is complete the sample is re-weighed and the gravitational water lost is taken as a measure of the air capacity or non-capillary pore space. Finally, the sample is oven-dried and its water-holding capacity calculated from the difference of oven-dry weight and weight after draining. Volume weight is obtained from the oven-dry weight. The method is fairly rapid and permits of the measurement of various properties in the same sample; its accuracy, however, may be affected by various factors which are briefly noted.

11.42. Soil Chemistry

11.42. LUNT, H. A. **Soil analyses significant in forest soils investigations and methods of determination: 1. Exchangeable bases, exchangeable hydrogen, and total base capacity.** [With discussion.] *Proc. Soil Sci. Soc. Amer. 1940* 5, 1941 (344–9). [Connecticut Agricultural Exp. Sta.] H.S.B.

The amount of soil taken for base exchange and other extraction studies should be based on volume rather than weight. Exchangeable bases are probably more important in most forest soil investigations than total base content, though the latter should be determined when fundamental characteristics of the soil are being studied. For exchangeable H, leaching with 1 N barium acetate appears to give the best results, but results are almost as good with 0·5 N barium acetate or 1 N potassium acetate. For total base capacity a titration method is better than the usual distillation method, particularly with organic materials. Preliminary saturation with H ions can be done with either 0·05 N hydrochloric acid or 0·5 N acetic acid, the latter being preferred when Ca or other bases are to be determined in the leachate. Displacement of H ions is best accomplished by the use of 1 N barium acetate and almost equally well with a 0·5 N solution. For exchangeable Ca, Mg, and K, 0·5 N acetic acid appears to be as satisfactory as ammonium acetate for mineral soils and superior for organic layers; it fits into the base-exchange determination equally as well as 0·05 N hydrochloric acid and has a lower solvent action than the latter.

11.42 : 12.19.2 : 12.25 : 11.49 (54). HOON, R. C., and DHAWAN, C. L. **A study of the carbon : nitrogen relationship of soils from the typical coniferous forests of the Himalayas.** *J. Ecol.* 29, 1941 (193–203).

In Himalayan soil profiles belonging to the podzol, brown earth, and gley types the C : N ratios were fairly high in the top horizon but decreased with increasing depth. The horizons of illuviation and the gley horizons had higher N contents and thus low C : N ratios. Profiles under Deodar (*Cedrus deodara*) had the highest average C : N ratios, followed by those under Blue Pine (*Pinus excelsa*) and finally those under Spruce (*Picea morinda*) and Silver Fir (*Abies pindrow*). In general, the C : N ratios of the soils examined were analogous to those reported for soils in other parts of the world, except that the C : N ratios of the top horizons were not as high. This difference is attributed to the comparatively higher base saturation and almost neutral reaction of the top horizons in the profiles examined.

11.43. Biology of Soil, including Mycorrhiza

11.43.1. FRAHM-LELIVELD, J. A. **A triple stain method for mycorrhiza in root cells.** *Natuurwet. Tijdschr. Ned. Ind.* 101, 1941 (114–5). R.A.M. 20 (486).

The following method was employed for the study of root cells of *Asarum europaeum* infected by a mycelium of the *Rhizoctonia* type. The material is fixed for 24 hrs. in 1 part of 2-per-cent. osmic acid solution and 2 parts each of 1-per-cent. chromic acid and 3-per-cent. potassium bichromate. After 30 minutes' rinsing in distilled water the pieces are transferred to a mixture of 1 part of pure pyroligneous acetic acid and 1-per-cent. chromic acid for 24 hours, followed by another half-hour's rinsing. Post-chromatization is effected by 3 to 6 days' immersion in 2-per-cent. potassium bichromate, after which the material is washed out for 24 hours in tap water, dehydrated, and embedded in paraffin. The unbleached microtome sections were stained with methyl (cotton) blue and safranin in lactophenol-alcohol. The cell walls, part of the protoplasmic contents, the secondary thickenings of the wood vessels, and the walls of the living mycelium in the host cells stain red; the mycelial contents stain blue, and the glomerules of ingested hyphae black. In the external cortical cells that serve as host cells, only the outer walls and the starch grains stain blue and their contents remain unstained, whereas in the layers in which ingestion proceeds the grains are uniformly swollen and usually burst, the walls staining blue and the contents red.

11.43.1. THOMAS, W. D. **A survey of northern Colorado flora bearing mycorrhizae.** *J. Colorado-Wyoming Acad. Sci.* 3 (1), 1941 (37–8). Biol. Abs. 15 (16427).

Only ectotrophic mycorrhiza are borne by common species of Salicaceae, Fagaceae, Ulmaceae, and Betulaceae; certain of the Oleaceae have only ectendotrophic mycorrhiza; and members of the Pinaceae and Rosaceae have both of these forms. Twenty-one families are listed in which some species have endotrophic mycorrhiza.

11.43.1 : 12.25 : 21.0 (931). MCKEE, M., and BIRCH, T. C. **Growth of Spruce at Conical Hill: a mycorrhizal explanation.** *N.Z. J. For.* 4, 1940–41 (311–3).

Of the Spruce (*Picea abies* and *P. sitchensis*) planted in Conical Hill State Forest between 1903 and 1916, those in the interior of pure stands are small, undersized trees and yellowish in colour, while those growing adjacent to Pines in particular, and also near Douglas Fir and Larch, show a marked increase in size and are a dark healthy green colour. Evidence suggests that the beneficial effects of these conifers is mycorrhizal. The mycorrhizal fungus *Boletus luteus* is prevalent beneath Pine stands in this area.

11.43.2. BORNEBUSCH, C. H. Skovbundens dyreliv. **[The fauna of forest soils.]** *Tidsskr. Skogbr.* 48, 1940 (293–309). [Da.] Biol. Abs. 15 (22584).

Soil-fauna populations are listed from sites under forest and other cover types in Denmark. Faunal activity was greatest in a good Beech mould and lowest under Beech with a poor cover of *Polytrichum*. Activity under grass may equal that under forest. It is lowest where litter blows away. The fauna has a vital influence upon soil structure and can be modified by forestry practices.

11.43.2 : 11.47.2 : 13.2. KALSHOVEN, L. G. E. Invloed van de locale macroscopische fauna, en met name van de termieten, op de vruchtbaarheid van den bodem. **[Influence of the local macroscopic fauna, especially the termites, on soil fertility.** With discussion.] *Tectona* 34, 1941 (568–82). [Du.] [Zoölogische Onderafdeeling van het Instituut voor Plantenziekten bij het Algemeen Proefstation voor den Landbouw, Buitenzorg.]

This conference paper brings together material from literature and scattered observations in the Dutch East Indies on the influence of the macroscopic fauna on soil fertility under three major headings:—(*a*) the natural supply to the soil of animal materials; (*b*) the breaking down by animals of dead organic matter; and (*c*) the influence of animal activities on the physical nature of the soil. Only passing notice is given to animals other than termites, and even for these the available information is scanty. There is still uncertainty on the conditions under which termite activity may be beneficial or otherwise to plant growth, and on the relation of such effects to physical or chemical alteration of the soil. The effects, however, exist. The few observations made in the Dutch East Indies relate chiefly to a stretch of termite-mound country between Tjikampek

and Djatibarang: here *siil* grass (*Andropogon amboinensis*) is reported to grow about twice as tall on the termite mounds as on the intervening ground, where more Cyperaceae occur, and in many cases trees and shrubs grow only on or adjacent to the mounds and must have originated after the mounds were built. Some natives regard the soil of the mounds as infertile, others the reverse; but it appears that mounds are left undisturbed in the rice fields chiefly because of the trouble of removing them. During the establishment of Teak plantations in this region, it was observed that the young trees, including the Lamtoro (*Leucaena* sp.), did fairly well on and near the mounds, whereas symptoms of disorder appeared in those on the remaining ground. In the worst parts the mounds were recognizable from a distance by their richer growth and greener colour. Better growth on the mounds was at first attributed to a better supply of nutrients brought up by water movement due to increased evaporation. However, it has since been shown that the nest of the species concerned (*Macrotermes gilvus*) may extend in a circle up to 5–6 m. around the mounds. Termite activity is believed to have had a detrimental effect on pasture land at Djatibarang, where the short grass on and around the old mounds was completely dead by the end of the dry season, apparently as a result of excessive desiccation. It is evident that fundamental research both on the biology of termites and on their effects on the soil is the only means of clearing up the present uncertainty.

11.44. Litter. Surface Humus

11.44 (74). HEIBERG, S. O., and CHANDLER, R. F. **A revised nomenclature of forest humus layers for the northeastern United States.** *Soil Sci.* 52, 1941 (87–99). [New York State College of Forestry.] O.R.E.

The purpose of this paper is to co-ordinate and unify previous work on the classification and terminology of forest humus layers of well-drained upland soil in the northeastern United States, and in particular to accommodate in a single classification the types recognized by Romell and Heiberg [*Ecology* 10, 1931 (567–8)] and Bornebusch and Heiberg [*Trans. 3rd Int. Congr. Soil Sci.* 3, 1935 (259–60)]. The classification and nomenclature at present proposed are as follows:—(I) *Mull*—A humus layer consisting of mixed organic and mineral matter; transition to lower horizon not sharp. Types recognized in this group:—(*a*) coarse mull, (*b*) medium mull, (*c*) fine mull, (*d*) firm mull, and (*e*) twin mull. (II) *Mor*—A humus layer of unincorporated organic material, usually matted or compacted or both, distinctly delimited from the mineral soil unless the latter has been blackened by the washing in of organic matter. Types recognized in this group:—(*a*) matted mor, (*b*) laminated mor, (*c*) granular mor, (*d*) greasy mor, and (*e*) fibrous mor.

Detailed descriptions and photographs are presented for each of these 10 types.

11.44 : 11.48 : 64. GRABHERR, W. Über die absolutkolorimetrische Kennzeichnung von Waldböden und deren Humusarten. [**The absolute-colorimetric characterization of forest soils and their humus varieties.**] *Bodenk. PflErnähr.* No. 21/22, 1940 (473–89). ForschDienst. 11 (64). [G.] S. & F. 4 (258).

Numerous colour properties of humus extracts were investigated with a view to correlating them with the silvicultural quality of the land. Only Hock's 'stability number' gave any indication of being characteristic of the humus conditions.

11.44 : 11.47.2 : 12.26–8. CHANDLER, R. F. **The amount and mineral nutrient content of freshly fallen leaf litter in the hardwood forests of central New York.** *J. Amer. Soc. Agron.* 33, 1941 (859–71). [Cornell University, Ithaca, N.Y.] L.S.

The amount of dry matter deposited annually by hardwood forest tree leaf litter in closed, second-growth stands in central New York ranged from 2,425 to 3,020 lb. per acre. The more productive soils, judged from agricultural crop yields, tended to produce somewhat more litter, but the differences were not large. The percentage N and Ca content of the leaves was not significantly different on the more productive and less productive soil types. The Mg content was higher and the P and K contents were lower on the more productive soils. Species whose leaf litter had a high N content were Basswood, Hop Hornbeam, Aspen, American Elm, Sweet Cherry, and Black Birch. Sugar and Red Maple had a low N content. The highest P content was exhibited by Cucumber Tree, Black Cherry, Basswood and White Ash, while Aspen, Hop Hornbeam, Beech, Red Maple, and Red Oak were rather low in P. The K content of the litter was the least consistent by species, apparently being determined more by soil type. However,

Tulip Poplar, Sweet Cherry, Cucumber Tree, Black Cherry, and Red Oak seemed to be rather high in K. The Ca content of the litter was high for Bitternut Hickory, Basswood, Black Cherry, Tulip Poplar, White Ash, and Aspen. The lowest Ca content was found in Beech, White Oak, Red Oak, and Red Maple. The Mg content was highest for Bitternut Hickory, Basswood, Black Cherry, and Tulip Poplar. The lowest Mg contents occurred in Beech, White Oak, Aspen, and Sugar Maple. Rather distinct differences in species composition existed on the various soil types: the more calcareous and fertile Ontario, Dunkirk, and Lansing soils were higher in the proportion of Basswood present, while the acid Lordstown soils had very large amounts of Sugar Maple, Red Oak, and Beech, with few Basswood. Differences in the average mineral nutrient content of the leaf litter falling on a given area were caused more by the inherent differences in the normal nutrient content of the litter of the various individual species than by the influence of the soil type upon the mineral content of a given species. K proved to be a partial exception to this statement. The average Ca content of the litter was closely correlated with the pH of the surface soil. This, again, was caused by differences in proportion of tree species present rather than by any one species absorbing more Ca on the high-Ca soils. It was demonstrated in the case of Sugar Maple, however, that if the pH of the surface soil is below 4·5, there may be a direct relationship between soil pH and Ca content of foliage. The actual amount of the essential nutrients returned to the soil was calculated. The average figures expressed as lb. per acre of the elements are as follows:—N 16·16 lb., P 3·3 lb., K 13·5 lb., Ca 65·6 lb., and Mg 9·2 lb. *From author's summary.*

11.44 : 11.47.2 : 12.26–8 : 11.42.2. GANTS, G. V. **The silvicultural importance of the Grey Alder as an accumulator of nitrogen.** *Mitt. Kirov. forsttech. Akad.* No. 58, 1940 (178–89). Chem. Abs. 35 (6722). P.R.

The N contents of young leaves of Grey Alder and Birch were, respectively: in green leaves 3·17 and 2·55 per cent. of dry weight; in fallen leaves 2·82 and 1·08 per cent. of dry weight. The greater part of N bound by Alder is added to the soil through the fallen leaves. Addition of amino acids to the soil through the roots of Alder is less than that from leguminous plants. The percentage of N in the upper 5 cm. of soil is greater under Alder than under Pine, Fir or Birch. Under young Fir and Alder trees the soil accumulates large amounts of nitrate N.

11.45. Geological Conditions. Soil Surveys

11.45.2. PROISSL, A. Mikroskopische Untersuchungen über Bodenbildung im niederdonauischen Waldviertel. **[Microscopic investigations on soil formation in the forest regions of the lower Danube.]** *Bodenk. PflErnähr.* No. 21/22, 1940 (112–40). Forsch-Dienst. 11 (52). [G.] S. & F. 4 (225).

Quantitative and qualitative studies of the movement of minerals during soil formation were made by microscopic examination of thin sections of undisturbed soil.

11.45.9 (728.2) : 12.19. CHARTER, C. F. **A reconnaissance survey of the soils of British Honduras north of the central metamorphic and igneous massif with special reference to their utilisation in agriculture.** Govt. Printer, Port-of-Spain, Trinidad. 1941. pp. 31 + map & figs.

11.45.9 : 64. MCKINNON, A. D. **Soil survey and forest management.** *N.Z. J. For.* 4, 1940–41 (296–9).

A brief note on the kind and detail of information required from soil surveys for use in forest management, with particular reference to New Zealand conditions. An outline is given for a general soil survey that is considered to be practicable under present conditions.

11.47. Maintenance of Favourable Soil Conditions

11.47.1 : 12.25 : 23.26.4. ANDREWS, L. K. **Effects of certain soil treatments on the development of Loblolly Pine nursery stock.** *J. For.* 39, 1941 (918–21). [American Lumber and Treating Co., New York City.]

Soil treatments consisting of Nitro Humite, commercial fertilizer (4–8–4), cottonseed meal, sandy clay loam soil introduced 5 in. under the soil surface, commercial fertilizer (4–8–4) plus sandy clay loam, peat worked 4 in. into the soil, peat plus commercial fertilizer (4–8–4), and peat plus cottonseed meal were applied before seeding to test their effect in improving sandy soils of low productivity for producing well

developed 1-year-old planting stock. The results indicate that the addition of a heavier-textured soil (preferable turned under to form a B horizon) or of organic matter will improve the physical character of sandy soil and stimulate Pine seedling growth significantly. Root-shoot ratio by weight is reduced but a root system with a large number of small branching rootlets develops in these media. Concentrated fertilizers with a high phosphorus content tend to increase root-shoot ratios. Readily soluble fertilizers appear to leach through sandy soils rapidly and therefore are most efficient when applied a few weeks after seed germination. Apparently the most desirable planting stock will be produced when both organic material and concentrated fertilizer containing a high percentage of phosphorus are added to sandy soil. *From author's summary.*

11.47.1 : 12.25 : 12.26–8 : 23.3. CUMMINGS, W. H. **Fertilizer trials for improved establishment of Shortleaf Pine, White Ash, and Yellowpoplar plantings on adverse sites.** *J. For.* 39, 1941 (942–6).

The tests involved the application of 27 mixes of fertilizer supplying $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ gram each of N, P_2O_5, and K_2O per tree, with supplements of acid peat or dolomitic limestone. The fertilized trees showed no marked superiority over untreated trees in height increment through the first 2 years, although differential effects of the individual nutrients are shown for the different species. While results of these tests afford no basis for recommendations for planting practice, they suggest that the following treatments might well be used in further tests on these species: Shortleaf Pine—fertilizers with low nitrogen, high phosphorus, very low potassium, and supplements of acid peat; White Ash—fertilizers with high nitrogen, low phosphorus, very low potassium, and supplements of acid peat; Yellowpoplar—fertilizers with medium nitrogen, very low phosphorus, low potassium, and dolomite limestone filler. *From author's summary.*

11.47.13 : 12.25 : 23.26.4. NĚMEC, A. Der Einfluss der Düngung auf das Wachstum der Fichten in der Waldbaumschule und auf ihre weitere Entwicklung nach dem Versetzen ins Freiland. [**The influence of fertilizing on the growth of Norway Spruce in the forest nursery and upon further development after planting out.**] *Bodenk. PflErnähr.* 24, 1941 (113–28). [G.] R.M.I.

Fertilizing with 40 per cent. potash salt, Chile saltpeter, superphosphate and (Thomas) basic slag, on an acid soil poor in nutrients, improved the growth of young Norway Spruce. Investigation of the nutrient content of 1- to 3-year-old Spruce grown on the poor soil of the nursery showed them to be deficient in K. The 3-year-old stock was transplanted to a soil poor in Ca and P_2O_5 but rich in K. A comparison of its growth during the next 5 years with that of the stock left in the nursery showed that those trees that had already grown satisfactorily in the nursery continued to grow well. Only those plants that had failed to make good growth in the nursery, owing to unsuitable fertilizing, showed less growth after transplanting than the unfertilized stock in the nursery. Basic NK fertilizers had a detrimental effect upon growth. Progressively large applications of P_2O_5 gave progressively better growth. When growth was good the fully fertilized stock could succeed with a smaller root system than could the unfertilized stock or that given only NK fertilizer. Suitable fertilizing in the nursery guarantees favourable growth after planting out.

11.49. Soil Types

11.49 : 12.19.2. CADY, J. G. **Soil analyses significant in forest soils investigations and methods of determination: 3. Some mineralogical characteristics of podzol and brown podzolic forest soil profiles.** [With brief discussion.] *Proc. Soil Sci. Soc. Amer. 1940* 5, 1941 (352–4). [Cornell University.] H.S.B.

Hornblende and the other amphiboles and pyroxenes decompose fairly readily under conditions of podzolization; epidote, magnetite, and garnet are little affected. The relative abundance and fresh, unaltered appearance of easily weathered minerals in the brown podzolic A horizons indicate that podzolization is less intense under the hardwood forest type than under the Spruce/hardwood association on podzols, whose A horizons show much greater decomposition of such minerals. The study disproves the hypothesis that the brown podzolic soils are true podzols in which the bleached horizons have been marked by incorporated organic matter; and as there appears to be a distinct difference between the two types of profile, the establishment of brown podzolic soils as a new great soil group would be justified.

11.49 : 23.3 : 12.19.2 (77). WILDE, S. A. **The subdivision of the grey-brown podzolic soils from ecological and silvicultural viewpoints.** *Proc. Soil Sci. Soc. Amer. 1940* 5, 1941 (336–40). [Wisconsin Agricultural Exp. Sta.] H.S.B.

A survey of climatic conditions, native vegetation, and profiles indicates that the 'grey-brown podzolic soils' in the east and middle west of the central United States include two genetically and ecologically independent land types: eastern podzolic or weakly podzolized soils and western nut-structured prairie-forest soils. The western border of Indiana serves as an approximate boundary between these two groups. The soils in the eastern portion of the region are formed in the humid-mesothermal climate. They are characterized by absence of a duff layer, incorporated humus, and poor differentiation of the profile horizons. The virgin forest consisted of productive stands of 'central' and 'northern' hardwoods which attained a productivity of 30,000 bd. ft. per acre. The eastern soils occupy a natural forest area suitable for reforestation by the generally accepted silvicultural methods. The soils in the western portion of the region are formed under the humid-microthermal climate. Their profiles are characterized by a substantial duff layer, a pronounced leached layer, a nut-structured accumulative horizon, and a substratum containing some carbonates. These soils are identical with soils of Eurasia described under the names of 'prairie-forest soils', 'degraded soils', 'nut-structured soils', 'grood soils', and 'grey forest soils'. The development of leached soils in the proximity of chernozems, i.e. in a comparatively dry region, appears to be due chiefly to the effect of low winter temperature, which arrests the activity of micro-organisms and leads to the accumulation of degradation-encouraging Oak litter. Prairie-forest soils support the 'Oak/Hickory' forest type, distinguished by a low productivity, not exceeding 10,000 bd. ft. per acre, and the presence of prairie species in the ground cover. They present a prairie-forest transition in which reforestation is handicapped by a number of adverse conditions and requires a special approach, viz. particularly careful selection of planting sites, wide use of the pioneer species, repeated cultivation of plantations, precautions against rodents and root-rot diseases, and, in some instances, inoculations with symbiotic fungi. *From author's summary.*

11.6. *Hydrographical Conditions. Water and Soil Conservation*

11.62 : 12.11.14 : 91.3 (922). GONGGRIJP, L. De verdamping van het gebergtebosch in West-Java op 1750–2000 m. zeehoogte. **[The evaporation from mountain forest of West Java at 1,750–2,000 m. above sea level.]** *Tectona* 34, 1941 (437–47). [Du.du.e.]

From hydrological data for 9 adjacent catchment areas near Tjiwidei, West Java, at altitudes 1,750–2,000 m. above sea level, it is calculated that the total yearly evaporation (transpiration plus evaporation from the soil and plant surfaces) of the mountain forest probably amounts to an average of 1,250 mm. As the local rainfall is approximately 3,300 mm. per annum, loss by evaporation is about 40 per cent. and the coefficient of run-off is about 60 per cent., which is regarded as normal for the conditions represented.

11.62 : 12.19.3. JOHNSON, W. M., and NIEDERHOF, C. H. **Some relationships of plant cover to run-off, erosion, and infiltration on granitic soils.** *J. For.* 39, 1941 (854–8). [Rocky Mt. Forest & Range Exp. Sta.]

A study undertaken on the watershed of the South Platte River in central Colorado to determine the effect of rainfall intensity and plant cover types (abandoned field, valley bunchgrass and mountain bunchgrass) on surface run-off and erosion and of the effect of individual plant species on the infiltration capacity of the soil showed that:—(1) The abandoned field type produced the most run-off, the valley bunchgrass an intermediate amount, and the mountain bunchgrass the least. This was true of rainfall intensities of both two inches and four inches per hour. (2) Within each of the three types studied, plant density seemed to have no definite effect on surface run-off or infiltration, probably due to extreme coarseness of the soil. (3) The volume of erosion per cu. ft. of run-off was greatest on the abandoned field, intermediate on the mountain bunchgrass and least on the valley bunchgrass type. Porous soil, gentle slopes, and a high plant cover density all combine to decrease erosion. (4) Of the 14 plant species compared to bare soil, two species increased the infiltration capacity of the soil, two species decreased it, and ten species had no significant effect. *From authors' summary.*

11.62.1 (941). **Soil erosion in Western Australia.** *Aust. For.* 6, 1941 (39–41).

Extracts from the recently published report of the Soil Conservation Committee of Western Australia. The incidence of water and wind erosion in the agricultural areas within the 12- to 15-in. rainfall belt is discussed on the basis of questionnaires returned by farmers. Shelterbelt planting is among the measures advocated against wind erosion.

11.62.1 (59.1) : 43 : 23.1 : 12.26.8. MANNING, D. E. B. **Erosion in the *Yomas* of the North Pegu Forest Division.** *Indian For.* 67, 1941 (462–5).

In Burma, forest conditions do not prevent erosion in the drier types of forest that are subject to annual grass fires, as the fires destroy the protective vegetation, litter, and surface humus, besides pulverizing the surface soil and thus rendering it more erodible. Both sheet and gully erosion are serious in the North Pegu Yomas; timber is lost through the undermining of trees; and severe silting occurs in most of the streams. Two factors other than fire have contributed to erosion in this area:—(i) the maturity of the Kyathaung Bamboo, which has long since stifled out most of the ground cover, and (ii) landslides due to earthquakes in 1930. Fire protection has been avoided in the past for reasons of expense and because it was argued that evergreen species would be encouraged to the detriment of Teak. The latter reason is probably not valid except in areas where evergreen forest is known to be invading. It is thought that fire protection would result in sufficient ground cover to stop erosion and would also eliminate the widespread fire damage to the butts and roots of Teak trees. Teak regeneration depends mainly upon the opening provided by the death of the Bamboos after flowering. The author suggests that such forests should be left alone after the flowering of the Bamboos until the Bamboo canopy begins to suppress undergrowth, when fire protection would be needed up to the time of girdling. After girdling, the area should be fired until extraction takes place, in order to check excessive weed growth and encourage advance growth of Teak. Immediately after extraction and before the fire season, improvement felling should be done; no inflammable material should be left near the base of Teak trees, and the area should be burnt for the last time until the next girdling. At the time of Bamboo flowering fire protection should be abandoned so that as much Teak regeneration as possible will establish itself in readiness for the death of the Bamboos.

11.62.1 : 12.19 : 11.48 : 91.3. COSTER, C. Begroeiing, grondsoort en erosie. **[Vegetation cover, soil type and erosion.**—With discussion.] *Tectona* 34, 1941 (519–47). [Du.] [Proefstation West Java, Buitenzorg.]

11.62.1. LEEUWEN, W. VAN. Aanteekeningen over erosie. **[Notes on erosion.**—With discussion.] *Tectona* 34, 1941 (548–56). [Du.] [Bodemkundig Instituut van het Algemeen Proefstation voor den Landbouw, Buitenzorg.]

Two conference papers discussing erosion in general, with some reference—mainly from literature—to conditions in the Dutch East Indies. There is still a need for much fundamental research on erosion and its relation to vegetational cover and soil types in this region.

11.62.11 : 11.48.2 : 42.4 (77.4). LEHOTSKY, K. **Sand dune fixation in Michigan.** *J. For.* 39, 1941 (998–1004). [Soil Conservation Service.]

Fixation of dunes consists of stabilization and reforestation. To secure the stability of sites live or dead materials are used as erosion-preventing obstructions. Beachgrass (*Ammophila arenaria*) is the most suitable live material and brush is the most generally used dead material. Stabilized sites are reforested chiefly with Jack and Scotch Pine on the poorest sites, Red and White Pine on the most fertile sands, and Red and Scotch Pine on dunes of intermediate fertility. *From author's summary.*

11.62.22 : 11.41.5–6 : 11.48.2 : 65.7. LETKOVSKI, A. I. **The change in the permeability to water of sands and sandy soils under the influence of forest fellings.** *Lesnoe Khozyaystvo, Moscow* 1941 (6), (11–7). [R.] L.S.

The investigation described was carried out in the Kirov region in young and in almost mature stands of *Pinetum hylocomiosum* and *P. hypnosum*, on sandy soils and sands, respectively. In both forest types and irrespective of the age of the stands, the permeability was satisfactory where the stand density exceeded 0·7, but where this density was about 0·4–0·6, the permeability was almost as poor as on clear-felled plots.

11.62.3 : 07.7. ANDERSON, A. G. **A combination suspended-load sampler and**

velocity meter for small streams. *Circ. U.S. Dep. Agric.* No. 599, 1941. pp. 26. [Soil Conservation Service.]

11.62.31 (59.1). CHEYNE, G. C. **Silt-bearing streams.** *Indian For.* 67, 1941 (564–8).

A short description of the hill streams that discharge into the Myitmaka River in Burma, and of the methods adopted to stabilize their channels and reclaim adjacent flood land in their lower reaches, where the deposition of silt begins. Present training practice is based on the use of bamboo-stake fences that run parallel with the stream and catch flotsam, thus forming a partial barrier and checking the flow of flood water so that silt is deposited on the landward side, where it forms banks and raises the level of the adjacent ground. When reclamation is completed along a course, the stream is diverted into a new course more or less parallel with the old one and the stabilizing process is repeated. The low-lying areas are being methodically reclaimed in this manner and where a few years ago annually flooded scrub jungle was the only vegetation, paddy cultivation is now possible on wide, flat banks that are free from all but the highest floods.

11.62.31 (66.9). FAIRBAIRN, W. A. **A note on river erosion.** *Farm & Forest* 2, 1941 (93–4).

Extensive erosion and scouring was noted on those parts of the Jibiya River in northern Nigeria where natural vegetation had been destroyed, whereas within a forest reserve the river banks were firmly fixed and there was no sign of erosion. It is concluded that there should be no farming or disturbance of the soil for at least 15 ft. from the high-water level on river banks.

12.1. *General Botany*

12.11. Physiology. Reproduction. Growth

12.11.2. *Propagation. Growth. Development*

12.11.2 : 12.11.3. STEBBINS, G. L. **Apomixis in the angiosperms.** *Bot. Rev.* 7, 1941 (507–42). [University of California.]

12.11.22 : 12.25. QUEENSLAND. **Annual report of the Sub-Department of Forestry for the year 1940–41.** Govt. Printer, Brisbane. [1941]. pp. 8.

It has been found to be impossible to develop a leader on branch cuttings of *Araucaria cunninghamii* (p. 3).

12.11.22 : 12.25. JANSON, R. W. G. **Coppicing of Corsican Pine.** *N.Z. J. For.* 4, 1940–41 (295).

A high percentage of coppicing took place following the clearing of 3-year-old *Pinus laricio* by slasher.

12.11.22 : 12.26–8 : 12.11.15. SNOW, A. G. **Effects of indolebutyric, indoleacetic, and naphthaleneacetic acids on rooting of Red Maple cuttings.** *Tech. Note Ntheast. For. Exp. Sta.* No. 46, 1941. pp. 2.

Red Maple cuttings, collected in June, were treated with the three growth substances at concentrations of 100, 200, and 400 mg./l. for 3 hours. Results showed indolebutyric acid to be the best for use with greenwood cuttings of this species, naphthaleneacetic acid to be nearly as good and indoleacetic acid to be inferior.

12.11.22 : 12.26–8 : 34.27. HAIGH, J. C. **The vegetative reproduction of Kapok.** *Trop. Agriculturist* 96, 1941 (164). L.S.

Experiments were undertaken to check the truth of statements that grafts made with buds from the main stem of *Ceiba pentandra* produce upright trees, whereas those with buds from side branches tend to give a drooping habit. Of 69 successful grafts with buds from the main stem of the parent tree all gave upright growth in the offspring, while of 60 successful grafts with buds from side branches only 13 produced upright growth. In all cases where buds from side branches were used the scion emerged from the stock at a wider angle than scions derived from the main stem, though some subsequently became upright, producing the 13 plants so classed above. The only distinction is between the main stem and the branches: otherwise it is immaterial from what part of either the buds are taken.

12.11.23 : 12.25. SEXTON, A. N. **Notes on the early growth of three species of *Agathis*.** *N.Z. J. For.* 4, 1940–41 (319–23).

Details of seed, nursery conditions and early development are tabulated for the species *A. australis*, *A. robusta*, and *A. palmerstoni*, seed for the last two being obtained from Queensland. Notes are also given on the seed germination and early development of *A. australis*, the data being obtained from an examination of sectioned germinating seed, made every seven days up to the time (63 days)

that the terminal bud first appeared on the seedling.

12.11.3. *Heredity. Breeding. Hybridization. Races and Questions of Provenance*

12.11.3 : 12.25 : 21.61. RUBNER, K. III. Beitrag zur Kenntnis der Fichtenformen und Fichtenrassen. **[Third contribution to our knowledge of the forms and races of Spruce.]** *Thar. forstl. Jb.* 92, 1941 (462–72). [G.]

Spruce of the plate type (Plattentyp), having a layered crown structure due to the branches of the first order growing rigidly at a right angle to the stem, have now been observed by the author in two localities of the Bavarian Alps. The chief regions of distribution of this type of *P. abies* are the high elevations of the Glatzer and the Altvater Mountains.

12.11.3 : 12.25. RUBNER, K. Die Ergebnisse zehnjähriger Fichtenproveniensversuche im Erzgebirge. IV. Beitrag zur Kenntnis der Fichtenformen und Fichtenrassen. **[The results of 10-year Spruce provenance trials in the Erzgebirge. IV. Contribution to our knowledge of the forms and races of Spruce.]** *Thar. forstl. Jb.* 92, 1941 (526–45). [G.g.] [Sächsische Forstliche Versuchsanstalt.]

Sets of Spruce trees from seed native to different elevations of the Riesengebirge and the Erzgebirge were grown at different altitudes in the Erzgebirge. The comparison of the height growth of the different provenances at the age of 10 years confirmed previous observations by the author, according to which there exists in the Riesengebirge a high-altitude race of Spruce above, and a low-altitude race below, an elevation of approximately 1,000 m. Furthermore, it now seems that there also exists an intermediate race, which is found in the Riesengebirge between 900 and 1,100 m. altitude, and whose lower limit in the Erzgebirge appears to reach down to 750–800 m. above sea level. At low altitudes, the height growth of provenances from high and intermediate elevations is considerably less than that of provenances from low elevations, but these differences diminish at high altitudes.

12.13. Embryology

12.13 : 12.25. NELSON, M. L. **Polyembryony in seeds of Southern Pines.** *J. For.* 39, 1941 (959–60).

Report of the development of multiple seedlings from single seeds of *Pinus palustris*, estimated for one large lot of seed at 1 per cent. of the seeds germinated, and to a lesser extent from seeds of *P. caribaea*, *P. echinata* and *P. taeda*. [Cf. *For. Abs.* 2 (288), 3 (29).]

12.13 : 12.25. BUCHHOLZ, J. T. **Embryogeny of the Podocarpaceae.** *Bot. Gaz.* 103, 1941 (1–37). [University of Illinois, Urbana.] O.B.D.

This investigation is concerned chiefly with details of early stages in the embryogeny of *Podocarpus dacrydioides* and with a more complete series of stages of *P. urbanii*, *P. macrophyllus maki*, *P. totara*, and *Phyllocladus alpina*. About a dozen additional species of *Podocarpus* are described from observations of one or a few critical stages each. *From author's summary.*

12.13 : 12.26–8. EKDAHL, I. Die Entwicklung von Embryosack und Embryo bei *Ulmus glabra* Huds. **[The development of embryo sac and embryo in *Ulmus glabra*]** *Svensk bot. Tidskr.* 35 (2), 1941 (143–56). [G.] Biol. Abs. 15 (24174).

Embryo sacs of *U. glabra* are tetrasporic and pass through 4 division stages. Polyembryony occurs and is due to the formation of (i) additional antipodal embryos, (ii) 2 micropylar embryos in the same embryo sac, or (iii) 3 embryo sacs within one ovule.

12.14. Anatomy. Histology

12.14.8 : 11.15 : 12.14.2. ZEEUW, C. DE. **Influence of exposure on the time of deep cork formation in three northeastern trees.** *Tech. Publ. N.Y. St. Coll. For.* No. 56, 1941. pp. 10.

The species studied were Red Ash (*Fraxinus pennsylvanica*), Tulip Poplar (*Liriodendron tulipifera*), and White Pine (*Pinus strobus*). It is concluded that the time at which deep cork first forms varies in a given species according to the exposure or shading to which the tree has been subjected, although variations in the degree of shading beyond the closure of the crown cover are not effective. Exposed trees form deep cork earlier than do those which have been sheltered from direct insolation. Differences in the mean ages at which deep cork formation begins in the species studied appear to be due to specific inheritance rather than to environment.

12.19. Geographical Distribution. Plant Geography and Sociology

12.19 (59.1). WARD, F. K. **The Vernay-Cutting Expedition, November, 1938, to April, 1939: Report on the vegetation and flora of the Hpimaw and Htawgaw Hills, northern Burma.** *Brittonia* 4, 1941 (1–19).

The account of the vegetation of this region is prefaced by notes on topography, climate, population, economic plants, and geology and soil. The types of forest met with are:—tropical moist evergreen and semi-deciduous forest, subtropical moist evergreen hill forest, subtropical Pine/Oak forest, temperate moist evergreen (*Pinus*/*Quercus*/*Magnolia*/*Tsuga*) forest, coniferous forest (*Abies*/*Rhododendron*), and *Rhododendron* scrub forest. There are probably many useful timbers in these forests, but at present the cost of extraction would be prohibitive. The tree *Rhododendrons* should yield a valuable veneer wood. *Pinus insularis* is the timber most used locally; *Castanopsis* sp. is being tried for bridges, bungalows, etc.; and wood of *Taiwania cryptomerioides* is exported to China for coffin making.

12.19 (67.6) : 11.4. THOMAS, A. S. **The vegetation of the Sese Islands, Uganda. An illustration of edaphic factors in tropical ecology.** *J. Ecol.* 29, 1941 (330–53). [Department of Agriculture, Uganda.]

The vegetation of the Sese Islands, in Lake Victoria, is remarkable for the sharp division between belts of tropical evergreen forest and short sparse grassland, whereas from climatic conditions it would be expected that the islands should be covered with forest. Between 1910 and 1920 the islands were evacuated of men and livestock on account of severe sleeping sickness, and during this period trees spread very slowly into the grassland, though the farms quickly reverted to forest. These conditions are attributed to differences in soil composition, as analyses have shown that the soils under grassland are poorer in available nutrients than those of adjacent forest. It is suggested that insufficient importance has been attached to edaphic factors in tropical ecology, particularly in relation to agricultural problems.

12.19 (67.7 : 63). GILLETT, J. B. **The plant formations of western British Somaliland and the Harar Province of Abyssinia.** *Kew Bull.* 1941 (37–199).

Seven plant formations occur in this region: (i) subdesert; (ii) *Commiphora*/bush-*Acacia* open deciduous scrub; (iii) tree-*Acacia* open woodland; (iv) tree-*Commiphora*/*Acacia*/Combretaceae deciduous scrub; (v) evergreen scrub; (vi) evergreen forest; and (vii) *Erica* thickets. The component associations and secondary communities of these formations are described, with brief notes on occurrence, site factors, and economic use. The *Commiphora*/bush-*Acacia* formation yields gums and resins, of which myrrh from *Commiphora cuspidata* and gum arabic from *Acacia somalensis* are the chief. The tree-*Acacia* open woodland formation produces gum arabic from *Acacia senegal* and *A. bussei*, and if the demand were sufficient, most of the *Acacia* association could be converted, by broadcast sowing and protection from grazing, into *A. senegal* stands; *Acacia bussei* and *Terminalia brownei* produce barks used for tanning, but these may be of little economic importance. The evergreen forest formation might be valuable for timber of *Podocarpus gracilior* and *Juniperus procera*, but is at present largely wasted, being burnt down to clear the ground for temporary cultivation; large areas now covered by valueless tangle and scrub or poor grassland could grow *J. procera* in fairly large quantities.

12.19 (729.9). STEHLÉ, H. **The flora of Martinique.** *J. N.Y. bot. Gard.* 42, 1941 (235–44).

A semi-popular descriptive note on the native vegetation and cultivated crops of the island. Little of the primitive forest now remains.

12.19 (79.2) : 13.15 : 13.19. TANNER, V. M. **A biotic study of the Kaiparowits region of Utah.** *Great Basin Nat.* 1 (3/4), 1940 (97–126). Biol. Abs. 15 (21162).

The communities discussed are:—the desert-prairie community; the Pinyon/Juniper association; the Yellow Pine/Oak/Manzanita community; the Spruce/Balsam/Aspen association; and the Engelmann Spruce/alpine association. Faunas associated with these are reported.

12.19 (944) : 11.4. DAVIS, C. **Plant ecology of the Bulli district. Part II: Plant communities of the plateau and scarp. Part III: Plant communities of the coastal slopes and plain.** *Proc. Linn. Soc. N.S.W.* 66, 1941 (1–19; 20–32). [New England University College, New South Wales.] L.S.

Two papers in continuation of an ecological account [*Proc. Linn. Soc. N.S.W.* 61, 1936

(285–97)] of this region of New South Wales, the forest communities of which are composed chiefly of Eucalypts. Special attention is paid to the relationship of plant communities to geological and soil conditions.

12.19 : 12.25 (481). GLØERSEN, F. Granen på Sørlandskysten. **[Spruce on the south coast of Norway.]** *Tidsskr. Skogbr.* 49, 1941 (75–80). [Nor.] Biol. Abs. 15 (22594).

Picea abies occurs naturally on the islet of Justøy, off the south coast of Norway, but was believed to be absent on the coast up to 50 km. inland for 800 km. west and north of this locality. It is now reported on and near the coast for 150 km. of this distance and forms forests elsewhere much closer than 50 km. from the sea. Factors affecting the occurrence of the species are discussed.

12.19 : 12.25 (498). GEORGESCU, C. C. Răspândirea orizontală a pinului silvestru în Carpații Romaniei. **[The horizontal distribution of *Pinus sylvestris* in the Rumanian Carpathians.]** *Anal. Inst. Cerc. Exp. for.*, Ser. 1, 5, 1940 (3–78). R.M.I.

12.19 : 12.25 (498). HARALAMB, A. Răspândirea naturală a pinului silvestru în județul Buzău. **[The natural distribution of *Pinus sylvestris* in the district of Buzău.]** *Anal. Inst. Cerc. Exp. for.*, Ser. 1, 5, 1940 (79–116). Bot. Zent. 35, 1941 (20). R.M.I.

12.19 : 12.26–8 (47.3). ROBOTNOV, T. A. **Types of *Alnus incana* stands in the north-western part of Moscow province.** *Bot. Zh.* 24, 1939 (15–29). Biol. Abs. 15 (16421).

In this region *Alnus incana* occurs both as widely distributed secondary stands that have arisen after the destruction of primary forests, and also as stands that are largely restricted to the bottoms of ravines and river valleys and are considered to be primary. The herb layer of *A. incana* forests is characterized by plants typical of the northern forms of broadleaved forests together with some nitrophilous species. A probable explanation for the composition of such a herb layer is that the stands arose in a broadleaved-forest environment; being similar in its shading to other broadleaved trees, Alder affects the ground vegetation in a similar manner and also enriches the soil with nitrogen.

12.19 : 12.26–8 (82). GIACOBBI, O. L., and ALFONSO, J. L. El área geográfica del raulí en la Republica Argentina. **[The geographical range of *Nothofagus procera* in Argentina.]** *Rev. Argent. Agron.* 6, 1939 (120–2). [Span.]

12.19 : 12.26–8 (76). MATTOON, W. R. **Swamp Black Gum in the South.** *J. For.* 39, 1941 (953–4).

A brief note on the distribution of Swamp Black Gum (*Nyssa biflora*) and on the features that distinguish it from Black Gum (*N. sylvatica*), for which it is often mistaken.

12.19.1. *Regional Floras*

12.19.1 (59.1) : 12.2. MERRILL, E. D. **The Upper Burma plants collected by Captain F. Kingdon Ward on the Vernay-Cutting Expedition, 1938–39.** *Brittonia* 4, 1941 (20–188).

New tree species are described in the genera *Litsea*, *Lindera*, *Sorbus*, *Eriobotrya*, *Photinia*, *Pygeum*, *Prunus*, *Albizzia*, *Ilex*, *Acer*, *Camellia*, *Eurya*, *Syzygium*, *Gamblea*, and *Symplocos*.

12.19.1 (77.3). **Forest trees of Illinois: how to know them.** Department of Conservation, Division of Forestry, Springfield, Ill. pp. 70.

12.19.2. *Forest Types*

12.19.2 (47.2–6). SHIMANYUK, A. P. **The chief types of forest in Zavetluzh'ya and their development in connexion with forest management.** *Trudy Bot. Sada Moskovsk. Ordena Lenina Gos. Univ.* 4, 1941 (119–56). [R.g.] Pl. Sci. Lit. 14 (22), (18).

12.19.2 (494). MOOR, M. Pflanzensoziologische Beobachtungen in den Wäldern des Chasseralgebietes (Berner und Neuenburger Jura). **[Plant-sociological observations in the forests of the Chasseral region (Bernese and Neuenburger Jura).]** *Ber. schweiz. bot. Ges.* 50, 1940 (546–66). [G.] R.M.I.

An ecological study of the region.

12.19.2 (59.5). GARFITT, J. E. **Malayan forest types.** *Malay. For.* 10, 1941 (136–40).

Scarcely anything has yet been done towards the description and classification of precisely defined forest types in Malaya, the six categories of forest at present recognized being so broad as to make their detailed description impossible and their practical value of very limited application. It is suggested that a committee might be formed to consider this matter and to issue questionnaires for completion by local officers; the information thus collected would be co-ordinated by the committee in a provisional

schedule of types that would be referred back to those possessing local knowledge for comment, and then finally revised.

12.19.2 (82). ALFONSO, J. L. Los bosques subantarcticos. **[The sub-Antarctic forests.]** *Repr.* from *Ingeniería Agronómica* 2 (10), 1940. pp. 12. [Span.]

Notes on the principal trees of the *Nothofagetum pumilis chusqueosum* forests of southern Argentine. The paper includes a detailed bibliography.

12.19.2 (931) : 12.25 : 12.26–8. SEXTON, A. N. **Notes on the Kauri-Beech (*Nothofagus truncata*) association in Omahuta State Forest.** *N.Z. J. For.* 4, 1940–41 (308–10).

With reference to an isolated area of *N. truncata*, which is only occasionally found in the north of New Zealand. Locality, site, stand composition, and growth form of the Beech are described briefly.

12.19.3. *Other Vegetative Types*

12.19.3 (43.1–5) : 12.19.2. HAUSRATH, H. Heide und Wald. **[Heathland and forest.]** *Allg. Forst- u. Jagdztg.* 118, 1942 (2–10). [G.]

Historical data on heathland distribution in north-western Germany. A large proportion of this land was formerly covered with forest.

12.19.4. *Succession*

12.19.4 (410) : 21.63 : 12.25 : 12.26–8 : 11.48.2. FARROW, E. P. **Notes on vegetation changes on Cavenham Heath, Breckland.** *J. Ecol.* 29, 1941 (215–6).

Plants of *Pinus sylvestris* and *Betula alba*, about 30 cm. high, were planted rather less than 30 years ago in a rabbit-proof quadrat and on the exposed grass heath round about. All the plants outside the quadrat were killed by rabbits, but two Birches and one Pine in the protected area survived. At present the Birches are well over 6 m. high and have overtopped and are suppressing the Pine. It is inferred that the very dry East Anglian heaths, sometimes supposed to have been primitively treeless, would quickly become converted to woodland in the absence of rabbit and other grazing and the activities of man.

12.19.4 : 12.19.23 : 43. MOHAN, N. P. **Controlled burning and change in vegetation.** *Indian For.* 67, 1941 (451–9).

Details of ground flora in 8 transects situated in burnt and unburnt *Pinus longifolia* sample plots are recorded both for June and September. Species peculiar to the burnt and unburnt transects are listed. Area under blanks is greater in the burnt transects, which have comparatively less vegetation. *From author's summary.*

12.19.4 : 23.4 : 23.52 : 21.0. STEENIS, C. G. G. J. VAN. Oekologische eigenschappen van pionierplanten. **[Ecological characters of pioneer plants.**—With discussion.] *Tectona* 34, 1941 (557–67). [Du.] [Herbarium van's Lands Plantentuin, Buitenzorg.]

Pioneer plants may have one or a number of special characteristics that enable them to colonize bare ground, where they may maintain themselves only temporarily if succession is normal, but more permanently under the influence of disturbing factors such as recurrent fire, cultivation, grazing, etc. Their flowering and seed production is usually abundant and rapid, often precocious; in addition the fruits and seeds are frequently adapted to particular means of dispersal and may have modifications that secure the retention of viability for long periods. Common morphological adaptations are heat-resistant bark, persistent protective leaf-bases or sheaths, thorns, the geophytic habit, and capacity to develop sprouts, suckers, or stolons. The root systems are generally efficient, and in a fair number of species symbiotic root-nodule organisms are present. Climatic and soil tolerance are generally much wider than in non-pioneer species. Pioneers are of considerable interest to both agriculturists and foresters, e.g. as ground cover or soil-improving nurse crops for difficult sites and in connexion with shifting cultivation, and it is urged that efforts should be made to collect data on their ecology, supplemented by trials of such species as may seem promising for particular purposes.

12.2. *Special [Systematic] Botany*

12.25. Gymnosperms

12.25 : 12.19 : 23 : 31.0 : 45 : 57. ALFONSO, J. L. El Pehuen, Araucaria o Pino del Neuquen en la Argentina. **[Pehuen, *Araucaria [araucana]* or Pino del Neuquen in Argentina.]** *Ingeniería Agronómica* 3 (14), 1941. pp. 14. [Span.]

Notes on the botanical characters, distribution, silviculture, timber properties, and utilization of *Araucaria araucana*. Fifty-nine references are quoted.

12.25. REID, J. S., and ORMAN, H. R. ***Dacrydium.*** *N.Z. J. For.* 4, 1940–41 (306–7).

A brief note on some diagnostic features of the seven New Zealand species of *Dacrydium* and on the characteristics of fruit and foliage that some of these species have in common.

12.26-8. Dicotyledons

12.26–8 (88) : 12.19.1. FRIES, R. E. **Annonaceae.** In *Flora of Suriname* (*K. Ver. Kolon. Inst. Amsterdam, Mededeel.* 30, *Afd. Handelsmus.* II). Ed. by A. Pulle. 2 (2), 1940 (341–83). Biol. Abs. 15 (19215).

Detailed treatment with descriptions, keys, and citations of literature and specimens.

12.26–8 (88) : 12.19.1. MOLDENKE, H. N. **Avicenniaceae.** In *Flora of Suriname* (*K. Ver. Kolon. Inst. Amsterdam, Mededeel.* 30, *Afd. Handelsmus.* II). Ed. by A. Pulle. 4 (2), 1940 (322–5). Biol. Abs. 15 (19238).

Detailed treatment of the one species, *Avicennia nitida.*

12.26–8 : 31.0. VICKERY, J. W. ***Backhousia anisata*: A new species of Myrtaceae.** *Contr. N.S.W. Nat. Herb.* 1 (3), 1941 (129–30). Biol. Abs. 15 (19265).

The species described is peculiar in having foliage with an odour of aniseed. Information on the qualities of the timber is compiled from collectors' field notes.

12.26–8 (88) : 12.19.1. LANJOUW, J. **Connaraceae.** In *Flora of Suriname* (*K. Ver. Kolon. Inst. Amsterdam, Mededeel.* 30, *Afd. Handelsmus.* II). Ed. by A. Pulle. 2 (2), 1940 (332–40). Biol. Abs. 15 (19226).

Detailed treatment with descriptions, keys, and citations of literature and specimens.

12.26–8 (81). HOEHNE, F. C. **Flora Brasilica.** Vol. 25, Fasc. 3, Nos. 126, 127. pp. 1–39. Soc. Agr. Ind. e Com. de São Paulo, Brazil. 1941. *Trop. Woods* No. 68, (61).

Descriptions and plates of 38 species and several varieties of *Dalbergia* and 6 species of *Cyclolobium* growing in Brazil. [Cf. *For. Abs.* 3 (116).]

12.26–8 : 12.14 : 31.1. O'DONELL, C. A. La posicion sistematica de '*Diclidanthera*' Mart. **[The systematic position of *Diclidanthera* Mart.]** *Repr.* from *Lilloa* 6, 1941 (207–12). [Span.g.] [Harvard University.] L.C.

Anatomic investigations revealed abnormalities in diameter growth and other characters indicating that this genus should be included in the family Polygalaceae.

12.26–8 (51). HU, H.-H. **Notes on the Fagaceae of Yunnan.** *Bull. Fan Mem. Inst. Biol.* (*Bot.*) [*Peiping*] 10 (2), 1940 (83–111). Biol. Abs. 15 (19219).

Includes 4 new species of *Castanopsis*, 5 of *Pasania*, a new var. in *Cyclobalanopsis*, and transfers in *Pasania* and *Cyclobalanopsis.*

12.26–8. BOR, N. L. ***Hopea shingkeng* (Dunn) Bor.** *Indian For. Rec.* (*n.s.*) *Botany* 2, 1941 (227–9). [Forest Research Institute, Dehra Dun.]

This species, described by Dunn from incomplete material as *Vatica shingkeng*, is now transferred to the genus *Hopea* as *H. shingkeng* (Dunn) Bor. The account contains a full description and a figure of the species.

12.26–8 (51). HU, H.-H., and TANG, T. **Notes on 5 new and several other known species of *Ilex* from China.** *Bull. Fan Mem. Inst. Biol.* (*Bot.*) [*Peiping*] 9 (5), 1940 (245–56). Biol. Abs. 15 (19220).

I. omeiensis and *I. hylonoma* from Szechwan, *I. litseaefolia* from Chekiang and Kwangtung, *I. editicostata* from Kweichow, *I. chingiana* from Kwangsi. Also *I. latifolia* var. *subrugosa* comb. nov. (*I. subrugosa* Loes.) and several new records for China.

12.26–8 (75.5). ALEXANDER, E. J. **Two new species from the southern Appalachians.** *Castanea* 6 (2), 1941 (30–2).

One of these is *Ilex collina* sp. nov. from Virginia.

12.26–8 (59.5). CORNER, E. J. H. **Notes on the systematy and distribution of Malayan phanerogams, IV: *Ixora.*** *Gdns'. Bull. Straits Settlements* 11, 1941 (177–235). [Botanic Gardens, Singapore.]

12.26–8 (88) : 12.19.1 KLEINHOONTE, A. **Mimosaceae.** In *Flora of Suriname* (*K. Ver. Kolon. Inst. Amsterdam, Mededeel.* 30, *Afd. Handelsmus.* II). Ed. by A. Pulle. 2 (2), 1940 (258–331). Biol. Abs. 15 (19223).

Detailed treatment with descriptions, keys, and citations of literature and specimens.

12.26–8. SMITH, A. C. **Studies of Pacific island plants.—I.** *Bull. Torrey bot. Cl.* 68, 1941 (397–406). O.B.D.

A key is given to the Pacific species of *Myristica*, followed by descriptions and records of the several species. *M. guillauminiana* sp. nov. is described from the New Hebrides.

12.26–8. EYLES, D. E. **The status of *Nyssa acuminata* Small.** *Castanea* 6 (2), 1941 (32–6).

Proposed as a variety of *Nyssa ogeche* Marsh.

12.26–8 (494) : 12.11.3. BUSER, R. Kritische Beiträge zur Kenntnis der schweizerischen Weiden. **[Critical contributions to knowledge of the Swiss Willows.]** *Ber. schweiz. bot. Ges.* 50, 1940 (567–788). [G.] R.M.I.

A detailed historical and taxonomic study of the Swiss Willows, including their hybrids. The suggestion is made that certain localities are more favourable to hybridization than others, and the hybrids are rarely found apart from their parent species. The main part of the work is devoted to descriptions.

12.26–8. MELVILLE, R. **Contributions to the study of British Elms. III. The Plot Elm, *Ulmus plotii* Druce.** *J. Bot., Lond.* 78, 1940 (181–92). O.B.D.

The taxonomic history of this species is discussed, and emended Latin and English descriptions and revised distribution records are given.

12.26–8 (88) : 12.19.1. MOLDENKE, H. N. **Verbenaceae.** In *Flora of Suriname* (*K. Ver. Kolon. Inst. Amsterdam, Mededeel.* 30, *Afd. Handelsmus.* II). Ed. by A. Pulle. 4 (2), 1940 (257–321). Biol. Abs. 15 (19237).

Detailed treatment with descriptions, keys, and citations of literature and specimens.

12.26–8 (86). CUATRECASAS, J. Estudios sobre plantas andinas. II. **[Studies on Andean plants. II.]** *Caldasia, Bogota* 2, 1941 (13–27). [Span.] *Trop. Woods* No. 68 (60).

Eleven new species of *Weinmannia*, all trees from 25 to 50 ft. tall, are described, mostly from specimens collected by the author at elevations of 6,000–8,000 ft. in the Andean region of Colombia.

12.29. Monocotyledons

12.29 (54.2) : 12.19.1. BOR, N. L. **Common grasses of the United Provinces.** *Indian For. Rec. (n.s.) Botany* 2, 1941 (vii + 1–200 + ii). [Forest Research Institute, Dehra Dun.]

12.29. BOR, N. L. ***Thyrsostachys oliveri* Gamble.** *Indian For. Rec. (n.s.) Botany* 2, 1941 (i + 221–5). [Forest Research Institute, Dehra Dun.]

A revised description and figure of this species are presented.

13.1. *General Zoology*

13.15 (74). HAMILTON, W. J. **The food of small forest mammals in eastern United States.** *J. Mammal.* 22, 1941 (250–63). [Cornell University, Ithaca, N.Y.] O.R.S.

Notes on stomach analyses of the hairy-tailed mole (*Parascalops breweri*), shrews (*Sorex* spp. and *Blarina brevicauda*), and mice (spp. of *Peromyscus*, *Clethriomys*, *Synaptomys*, and *Napaeozapus*).

13.15 : 12.14.8 : 12.25. RAMSEY, H. **Fauna of Pine bark.** *J. Elisha Mitchell sci. Soc.* 57, 1941 (91–7). [Duke University, Durham, N.C.] L.S.

In the Duke Forest 147 sq. ft. of bark of Loblolly and Shortleaf Pine trees was examined at all seasons, and 1,479 animals were collected from it, an average of 10·1 per sq. ft. These included the following species: insects, 78; spiders, 48; centipedes, 6; snail, 1; phalangid, 1; mites, 3; a total of 137 identified species. Little difference was found between the faunas of Loblolly and Shortleaf Pines. The greatest number of animals was found in the lowest sq. ft. examined, near the bases of trunks, and there were progressively fewer in the second and third sq. ft. There were, however, specific variations in this respect. The abundance of animals in the bark was directly correlated with temperature, and was shown to vary with time of day. It tended to vary inversely with the humidity. *From author's summary.*

13.15 : 13.2. GARDNER, J. C. M. **Immature stages of Indian Lepidoptera** (3). *Indian For. Rec. (n.s.) Entomology* 6, 1941 (299–314). [Forest Research Institute, Dehra Dun.]

13.2. *Special [Systematic] Zoology*

13.2 (931). MILLER, D. **The species of termites in New Zealand.** *N.Z. J. For.* 4, 1940–41 (333–4).

Termites now known to be found in New Zealand include the two native species *Stolotermes ruficeps* and *Calotermes brouni*, the latter causing extensive damage in service timbers, and the seven Australian species *C. insularis*, *C. condonensis*, *C. oldfieldi* var. *chryseus*, all of which are confined to Australian hardwood poles, *Porotermes adamsoni*, which is confined to railway sleepers, and *Coptotermes acinaciformis*, *C. frenchi* and *C. lacteus*, these last three subterranean species causing serious and extensive damage in building timbers, hardwood poles and native trees.

2. SILVICULTURE

2 (481). FAEGRI, K. Skog og skogproblemer i Sogn. **[Forests and forest problems in Sogne Fjord valley.]** *Tidsskr. Skogbr.* 48, 1940 (271–80). [Nor.] Biol. Abs. 15 (22591).

A critical review of a work by Søren Ve [*Medd. Vestland. forstl. Forsøkssta.* No. 23, 1940] on the forests and tree species of the upper Sogne Fjord valley, with reference to the effect of the diversified site conditions in the region. Group-selection cutting is advised for alpine forests. Natural extension of *Picea abies*, tree races, the genotypic significance of crown form, and the ability of *Populus tremula* to crowd out *Pinus sylvestris* in many situations, are discussed. *Picea abies* trees are said to be self-sterile.

2 : 09.1 : 6 : 12.19 : 12.25 (43.1–5). HAUSENDORFF, E. Wirtschaftsgeschichtliche und pflanzensoziologische Untersuchungen als Grundlage für den Waldbau im ostdeutschen Kieferngebiet. Mit einer Darstellung der Geschichte des Forstamtes Grimnitz und seiner Bewirtschaftung seit 1550. **[Investigations on history of management and plant sociology as the basis for silviculture in the east-German Pine region. With an account of the history of the Grimnitz forest district and its management since 1550.]** *Z. Forst- u. Jagdw.* 73, 1941 (1–36, 137–59, 169–94, 247–64). [G.]

2 : 12.26–8 (481). JENSSEN, J. Litt om bjørk. **[Notes on Birch.]** *Tidsskr. Skogbr.* 48, 1940 (212–21). [Nor.] Biol. Abs. 15 (19662).

Though Birch is the most important broad-leaved tree of Norway, it has recently suffered a decline in the area and quality of stands and in demand from industries. Improper forest management and forest grazing account for present conditions. Rational treatment is prescribed.

2 : 12.26–8 : 34.27. **Planting Black Walnut in Illinois.** Department of Conservation, Division of Forestry, Springfield, Ill. [1941?] pp. 7.

Information is given on the general characteristics, site requirements and methods of propagation, either by planting nuts or transplanting one-year-old seedlings. It is emphasized that this species requires deep fertile soil, well watered and well drained, and that it should be planted in mixture with other species. The only serious insect pest noted in this region is the Walnut caterpillar.

2 : 12.26–8 : 6 (43.8). KRAHL-URBAN, J. Die Eiche im 'Fürstentum Krotoschin' (Wartheland). **[Oak in the "Principality of Krotoschin" (Warta region).]** *Z. Forst- u. Jagdw.* 73, 1941 (343–61). [G.]

2 : 90 : 60.3 (74). **Recommended forest practice for New England. Report of the Committee on Silviculture, New England Section, Society of American Foresters, Springfield, Mass., February 6, 1941.** *News Quarterly, New England Section, Society of American Foresters* 2 (4), 1941 (2–11).

Simple, practical rules have been developed for the guidance of forest owners and managers in forest protection and cutting practice, with the object of improving conditions in New England forests. In the management plan presented, detailed information is given on location, forest conditions and cutting requirements for each of the principal forest regions of New England.

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

21.0. *Adaptability to the General Environment. Acclimatization*

21.0 (54.1) : 12.26–8. DE, R. N. **Notes on Pynkado—*Xylia dolabriformis*. An exotic in Assam.** *Indian For.* 67, 1941 (574–5).

Py[i]nkado is showing promise in the Sylhet and Cachar Divisions of Assam, and so far there has been no attack by insect pests, though one tree has been observed to be attacked by the Loranthaceous parasite *Scurrula parasitica* L.

21.0 (73) : 44 : 45. BOYCE, J. S. **Exotic trees and disease.** *J. For.* 39, 1941 (907–13) [Yale University.]

The use of exotics in forest stands and the extension of the range of native trees are considered in relation to the incidence of and damage caused by forest diseases and insects. Examples are cited from both European and American experience of exotics that have been introduced, often with early promise of success, and have later been heavily attacked by disease or insects that are either absent or innocuous in the native habitat of the tree species. Similar results may follow the extension of the range of

native species, although there is more chance of success as the natural habitat of the species is better understood or can be more readily determined. Instances of the successful introduction of exotics are noted, particularly the early results with American Pines in Australasia and South Africa. It is concluded that an exotic should have some essential advantages over the native species and should give some promise of success before being introduced and that its possibilities should be thoroughly investigated in a properly planned, long-time, experimental planting programme.

21.0 (922) : 12.26–8. VERHOEF, L. Voorloopige resultaten met eenige uit tropisch Amerika ingevoerde Leguminosen. [**Preliminary results with some Leguminosae introduced from tropical America.**] *Tectona* 34, 1941 (711–36). [Du.e.]

Seed of tropical American Leguminosae was imported between 1934 and 1940 in an endeavour to find a substitute for *Leucaena glauca*; for although this species has proved valuable for soil improvement, interplanting, and as a shade tree in plantations, it grows poorly at high altitudes and in very wet places, often shows excessive seeding at the expense of leaf production, and is too fast-growing for use with very slow-growing crops. The species here reported upon are:—(i) *Leucaena pulverulenta*, which shows some advantages over *L. glauca* as a shade tree for coffee, but is no better than the latter for interplanting, though it may be useful in reforestation if the chief aim is to secure cover rapidly. (ii) *L. glabrata*, which has proved unsatisfactory. (iii) *L. retusa*, all the plants of which have died. (iv) *L. trichodes*, so far tried on one site only. (v) *Leucaena* sp. 'd' (not yet identified), which may possibly show some value at high altitudes and as a shade tree. (vi) *Calliandra calothyrsus*, which may be useful as a green fallow and for interplanting if the main crop is widely spaced. (vii) *C. tetragona*, which does not appear promising and has too shallow a root system for interplanting, though it might be used as a green fallow if better root-nodulation could be stimulated.

21.0 (931) : 23.1 : 12.25. JOLLIFFE, W. H. **Natural regeneration of exotic species in Hanmer Springs district.** *N.Z. J. For.* 4, 1940–41 (300–5).

An examination of the twenty-one exotic conifers growing in or near the Hanmer State Forest, North Canterbury, showed no regeneration for nine species, little regeneration for five species and more or less profuse regeneration for the species *Abies alba*, *Larix decidua*, *Pinus nigra*, *P. muricata*, *P. radiata*, *P. sylvestris* and *Pseudotsuga taxifolia*. Details are given for each of these species and for the site conditions of the planting area, and suggestions are made for silvicultural practice in regenerating the more desirable of them.

21.0 (946 : 944). **Suitability of N.S.W. forest trees for Tasmania.** *Aust. Timb. J.* 7, 1941–42 (362, 365, 373).

With reference to Red Cedar (*Cedrela toona* var. *australis*), White Cedar (*Melia azedarach* var. *australasica*), Negrohead Beech (*Nothofagus moorei*), and Brown Pine (*Podocarpus elata*).

21.1. *Light and Temperature Requirements*

21.11 : 12.19. COLLAER, P. Le rôle de la lumière dans l'établissement de la limite supérieure des forêts. [**The role of light in determining the upper limit of forests.**] *Ber. schweiz. bot. Ges.* 50, 1940 (500–16). [F.] R.M.I.

In continuation of previous work [*Ber. schweiz. bot. Ges.* 43] the author examined trees of *Picea abies* in the Préalpes and in the Jura. The results confirmed his earlier observations that the light intensity is a limiting factor for the growth of trees. The timberline was found to be lower in the Préalpes and in the Jura than in the Grisons, and this is probably due to wind and cold. Light intensity had a similar effect upon the growth of Beech forests. The effect was caused by the visible light rays, and ultra-violet rays were not involved.

21.2. *Moisture Requirements. Water Régime*

21.2 : 12.11 : 23.21. OELKERS. Verdunstung und Zuwachs unserer Hauptholzarten als Funktion der Standortsfaktoren. Wesentliche Eigenschaften der Holzart. Holzartwahl. [**Transpiration and growth of our chief tree species as a function of site factors. Essential characteristics of the tree species. Choice of species.**] *Mitt. Forstwirtsch.* 11, 1940 (35–86, 143–71); *abstr.* in *Holz* 4, 1941 (262). [G.] P.R.

The results are presented of experiments with the principal tree species raised under

greenhouse conditions in Mitscherlich pots. Under favourable environmental conditions the optimum soil water, in percentage of the total water capacity, was 27 for Birch, 39 for Scots Pine, 41 for Norway Spruce, 44 for European Larch, and 50 for Silver Fir; thus these trees have specific soil-aeration requirements. Reckoning Birch at 100, the total transpiration of the other species was 53 for Pine, 51 for Spruce, 44 for Larch, and 16 for Silver Fir, and the gain in dry substance was 68 for Pine, 39 for Silver Fir, 35 for Larch and 28 for Spruce. The number of kg. of water required to produce 1 kg. of dry substance was 104 for Silver Fir, 197 for Pine, 245 for Birch, 299 for Larch, and 485 for Spruce.

21.2 : 12.26–8 : 21.32 : 11.62. IRVING, M. **A study of the effects of Eucalypts on the soil, their nutrient requirements, and transpiration.** *S. Afr. J. Sci.* 37, 1941 (133–5). [University of the Witwatersrand.] I.I.E.

Soil-moisture determinations have shown wide differences between soil under Eucalypt plantations and that under indigenous scrub in South Africa, indicating that whereas trees such as *Acacia caffra* and *Gymnosporia buxifolia* appear to conserve moisture, the Eucalypts make such great demands on the soil water that the ground cover is much reduced and there is little or no conservation of moisture. Chemical analyses showed much lower N, P, and K contents in the soil under Eucalypts. The chief detrimental effect of Eucalypts, however, is the removal of water by their shallow, spreading root systems. It is concluded that Eucalypts should not be planted near a water supply or where erosion might result in the absence of ground cover, and that crops should not be planted too near Eucalypt windbreaks. On suitable sites Eucalypt plantations need not be regarded as a menace.

21.3. *Soil Requirements*

21.3 : 23.3 (76.6) : 24.4. HARPER, H. J. **Relation of climatic conditions, soil characteristics, and tree development in the Southern Great Plains region.** *Proc. Soil Sci. Soc. Amer. 1940* 5, 1941 (327–35). [Oklahoma Agricultural Exp. Sta.] H.S.B.

The relation between climate and tree growth and the effect of the root habitats offered by different soils is briefly discussed. From the present study in Oklahoma it is concluded that: (i) In central Oklahoma trees adapted to the climatic environment, e.g. American Elm, Soft Maple, Black Locust, etc., will make good growth on upland soils if the surface layer contains not more than 25 per cent. and the subsoil not more than 30 per cent. of clay. A soil containing less than 20 per cent. of clay to a depth of 15 in. will support good tree growth even though the subsoil may contain more than 30 per cent. of clay. (ii) For shelterbelt sites in western Oklahoma the surface soil should contain less than 20 per cent. of clay to maintain satisfactory growth in the species planted. Chinese Elm, Black Locust, and other small-growing species can survive where the subsoil does not contain more than 25 per cent. of clay. Cottonwood and Catalpa have failed on upland sites where the subsoil contains more than 20 per cent. of clay. The trees commonly grown in this region will make fair growth on soils with nitrogen contents of more than 0·025 per cent. Honey Locust has done better on soils of low nitrogen content in western Oklahoma than on similar soils in the central part of the State. Black Locust, Shortleaf Pine, Red Cedar, and Catalpa made better growth than many other of the species studied on sandy soil with a nitrogen content of under 0·03 per cent. It is pointed out that loamy sand that has been depleted by agricultural cropping could be used to advantage on many farms for producing posts and fuelwood.

21.8. *Phenology*

21.8 : 11.21. HUBERMAN, M. A. **Why phenology?** *J. For.* 39, 1941 (1007–13). [Northeastern Forest Exp. Sta.]

A brief historical review is made of the literature on phenological investigation from its beginning in the middle of the eighteenth century to the present. In recent years—since about 1896—phenological studies appear to have developed in three ways:—(1) the construction of phenological calendars and charts, disregarding meteorological records; (2) the correlation of plant and animal activities with meteorological factors; (3) the application of the principles of bioclimatics based on geographic, climatic, topographic, and biologic factors. Methods of phenology are described briefly, with particular reference to England and North America, and some of the possible uses of the results are listed.

21.8 : 12.11.21 : 23.1 : 23.23.11 : 12.25. ALLEN, G. S. **A basis for forecasting seed crops of**

some coniferous trees. *J. For.* 39, 1941 (1014–6). [British Columbia Forest Service.]

A method of forecasting seed crops of Douglas Fir is based upon an estimate of the number of ovulate buds made in August or September of the year previous to maturation of the cones and seeds. This gives the potential cone crop that can be expected and should be modified to account for all adverse factors of importance, which include: adverse weather conditions, insect damage, abortions, which may be physiological, and possibly other factors. *From author's summary.*

21.8 : 12.11.23. VIKTOROV, S. **Hibernal growth of trees and shrubs.** *Uspekhi Sovrem. Biol.* (*Advances Modern Biol.*) 14, 1941 (514–23). [R.] Pl. Sci. Lit. 14 (12), (12).

21.8 : 12.14.5 : 12.11.15. GUTHRIE, J. D. **A preparation from yeast that is active in breaking the rest period of buds.** *Contr. Boyce Thompson Inst.* 12, 1941 (195–201).

21.8 : 56.01 : 11.21. COOK, D. B. **The period of growth in some northeastern trees.** *J. For.* 39, 1941 (956–9). [New York State Conservation Department.]

Data on the periodicity of height growth of a number of conifers and hardwoods from a forest in New York State are recorded for the growing season of 1940. Periodic rainfall, mean daily temperature and height growth in per cent. for each species are shown by means of graphs.

22. SILVICULTURAL SYSTEMS.

FORMS OF STAND

22.5 : 12.26–8. Anpflanzung und Kultur der Pappel. **[Planting and cultivation of Poplar.]** *Wbl. Papierfabrik.* 72, 1941 (114–8); *abstr.* in *Holz* 4, 1941 (262). [G.] P.R.

A strong plea for the growing of Poplars in combination with agricultural crops such as Jerusalem artichokes, potatoes, maize, or with pasturing. Artificial fertilizing is recommended.

22.88.1 (77.1–3) : 12.19.2 : 57.0 : 11.4 : 11.62.22. AUTEN, J. T. **Notes on old-growth forests in Ohio, Indiana and Illinois.** *Tech. Note cent. St. For. Exp. Sta.* No. 49, 1941. pp. 8.

Data are given on species, tree size, stand density, soils, and volume and basal area per acre for remnant old-growth stands scattered throughout the region. Forest associations were ranked according to moistness of site from White Pine on dry sites to Elm/Ash/Maple on wet sites. It was found that basal area was greatest on the two driest sites and that depth of the A_1 soil horizon increased with moistness of site. At depths of 1, 3, and 8 in., respectively, the old-growth woods soil absorbed water 50, 14 and 2 times as fast as comparable field soils.

22.89 (66.9) : 09.1 : 23.3. MCINTOSH, D. **The Tiv plantations: their history up to 1939.** *Farm & Forest* 2, 1941 (26–30).

About 1,000 square miles of country in southern Tiv Division, Nigeria, has been deforested as a result of the farming practice in this region, where there is a population density of 130–240 per sq. mile. In 1935 forest plantations were started with the object of supplying fuelwood and building poles. Species used included *Cassia siamea, Gmelina arborea, Dalbergia sissoo* and *Albizzia lebbek.* Work on the plantation is described briefly for the period up to 1939, when a total area of 1,241 acres had been planted.

22.89 (66.9) : 23.3 : 23.21. PATTULLO, M. L. **Plantation work in Northern Nigeria.** *Farm & Forest* 2, 1941 (71–5).

Owing largely to the scarcity of lands suitable for plantations and to the cost of transporting fuelwood, it is the present policy in Northern Nigeria to establish plantations only where fuelwood is very difficult to obtain or is in great demand. Techniques used in establishing plantations are briefly described, particularly 'dry nurseries' which receive no artificial watering, and the use of ridge sowings *in situ* for *Cassia siamea.* Notes are included on the silviculture of the more common plantation species and certain species that deserve further trial.

22.89 : 12.26–8 : 22.82 (729.7). BROOKS, R. L. **Notes on pure Teak plantations in Trinidad.** *Carib. For.* 3, 1941–42 (25–8). [E.e.span.]

Pure Teak plantations in Trinidad were started in 1913 and are being expanded at the rate of about 400 acres per annum, with a present total area of 2,100 acres widely distributed over the island. A list is given of standard practices based on 28 years' experience as adopted by a recent conference of technical officers.

23. FORMATION OF STANDS

23 (54.8). MADRAS. **Administration report of the Forest Department of the Madras**

Province for the year ending 31st March, 1940. Volumes I & II, Supt., Govt. Press, Madras. 1940. pp. 105.

Owing largely to the greater certainty and value of crops raised as a result of clear cutting and artificial restocking compared with those resulting from selection cutting and natural regeneration, the former system is being expanded in timber forests other than evergreen forest (p. 12).

23 (59.1). VORLEY, J. S. **Regeneration operations following on extraction by villagers in village supply reserves in Lower Burma.** *Emp. For. J.* 20, 1941 (145–50).

A rapid increase in the population of Lower Burma since 1918 has resulted in concentrated cultivation along the valleys of the Irrawaddy and Sittang rivers and the destruction of all accessible unreserved forest. In consequence there has been a heavy demand on reserve forests for village supplies of fuel, posts and building material. The writer describes regeneration operations that have been undertaken so far in a number of different types on accessible reserves with the object of establishing crops of the species suitable for village requirements without employing expensive tending operations. A regular system of coppice with or without standards will be adopted in later felling cycles.

23 : 12.25 : 76. KIAER, T. Naturskog–kulturskog. **[Natural versus cultivated forest.]** *Tidsskr. Skogbr.* 49, 1941 (67–75). [Nor.] Biol. Abs. 15 (22600).

At Solberg a series of forest stands about 17 ha. in extent and 28–32 years old have developed under nearly like conditions, except that some were planted, some were derived from natural regeneration with or without preparation of the soil, and some were sown after various site treatments. Planted stands of both Spruce and Pine are slightly better than natural ones, and direct sowing is least satisfactory. Thinnings when the stand is 30–35 years old amortise the cost of planting, with compound interest.

23.1. *Natural Regeneration*

23.1 : 12.25. CHEO, Y. C. **Factors influencing the reproduction of *Cunninghamia lanceolata* Hook. and *Pinus massoniana* Lamb.** *Sinensia* 11, 1940 (1–10). [E.chin.] L.S.

From a study in Szechuan it is concluded that the conditions most favourable to reproduction of both *P. massoniana* and *C. lanceolata* are gentle slopes, pure or mixed coniferous overwood, sparse undershrub layer, and scanty ground cover and litter. The only major difference in the behaviour of the two species is that regeneration of *C. lanceolata* is best with a thin overwood, whereas seedlings of *P. massoniana* are intolerant and develop best in open stands. Natural forests of these species have been destroyed, but the trees are now widely cultivated and managed by farmers on a rotation of 20–30 years, owing to the great demand for timber. Measures to encourage prompt regeneration after cutting are therefore highly desirable and should aim particularly at securing the light and litter conditions indicated above.

23.1 : 12.25. NEW ZEALAND. **State Forest Service. Annual report of the Director of Forestry for the year ended 31st March, 1941.** Govt. Printer, Wellington. 1941. pp. 50.

Investigations have shown that removal of ground cover and scarifying the ground under large Kauri (*Agathis australis*) trees before seed fall greatly improves natural regeneration (p. 14). The use of caterpillar tractors in the extraction of Kauri logs has proved of considerable assistance in this connexion (pp. 12–3). On areas where *Pinus radiata* has been clear-felled, regeneration is favoured by shelter from slash and ground cover, and slash burning, unless done very lightly, appears to be detrimental (pp. 14–5).

23.1 : 12.25 : 42.1. CHAPMAN, H. H. **Note on the history of a stand of Pine timber at Urania, La.** *J. For.* 39, 1941 (951–2). [Yale University.]

With reference to a stand of Longleaf Pine (*Pinus palustris*) and scattered Loblolly Pine (*P. taeda*) having three age classes, viz. veterans 260 years old, medium-sized trees 117 years old, and spindly younger trees 60 years old. Trees of the first class were released and those of the second established following a hurricane about 1811. A minor disturbance may have preceded the establishment of the 60-year-old trees, which are found only in the larger gaps in the stand and are poorly developed. It is concluded from this and other evidence that regeneration of Longleaf Pine should be secured by clear cutting groups at least an acre

in area and leaving not more than four selected seed trees per acre, preferably grouped together.

23.1 : 12.26–8 : 23.4 : 11.62 (931). ELDER, N. L. ***Nothofagus* regeneration in the Kaweka Range.** *N.Z. J. For.* 4, 1940–41 (324–7).

Description of the soil, a red pumice clay several feet deep, the topography and vegetation of a basin of the Kaweka Range. The original *Nothofagus* forest was destroyed by fire except in one or two hollows and this was followed by erosion of the soil from the higher slopes and the disintegration of the underlying rock. Regeneration has been going on for about 70 years and *Nothofagus*, particularly *N. cliffortioides*, is becoming established below 4,000 ft., although above that elevation erosion is still increasing.

23.1 : 60.31.2 (79.7). HAGENSTEIN, W. D. **Restocking of lands cut over under private management in western Washington.** *Univ. Wash. For. Cl. Quart.* 15 (1), 1941–42 (5–8).

Data from ten counties indicate that in recent years restocking has exceeded cutting.

23.2. *Artificial Regeneration*

23.2 : 76 : 84. KÜNANZ, H. Zur Statistik der Kulturkosten. **[Statistics of artificial-regeneration costs.]** *Allg. Forst- u. Jagdztg.* 118, 1942 (20–6). [G.]

A critical discussion of the methods of accounting as employed by the Forest Service of Hessen.

23.22. Preparatory Work. Auxiliary Measures.

23.22.2. (922) : 11.62.11 : 23.21. THORENAAR, A. Over den cultuuraanleg in Bagelen. **[On regeneration in combination with agriculture in Bagelen.]** *Tectona* 34, 1941 (679–86). [Du.]

This method of regeneration calls for special organization of clearing and planting work in the Bagelen district, Java, owing to the severe erosion that takes place on unprotected sites. All operations needing particular care are performed by groups of cultivators directed by a foreman. In January the cultivators begin clearing the land under supervision to ensure that the steepest slopes remain under cover. In March the foreman calls together the first group of cultivators and under his direction the lines of Kemlandingan [*Leucaena glauca*] are set out, if necessary with the aid of a clinometer, the terraces prepared, and the lines sown. After this the area is divided among the cultivators by mutual agreement and the field crops are planted. Meanwhile successive groups of cultivators are going through the same process, the last batch finishing the preliminary work in late April or early May. Work is thus conveniently spread out and good cover is secured before the rains come. Teak is the most important tree species. It is planted pure, but must be heavily thinned, otherwise the ground cover is killed out and erosion occurs [cf. *For. Abs.* 3 (304)]. On steep slopes phototropism causes the leaders to bend away from the mountain side, and care should be taken to avoid the disposition of trees in vertical rows. Under such conditions Teak can be grown on slopes of up to 35°. On steeper slopes more soil cover must be provided, e.g. by establishing Segawe [*Adenanthera microsperma*] in mixture with *Tarenna incerta*. Abundant undergrowth always develops under Segawe in this district, and the tree furnishes bark, fuelwood and charcoal, which are in great demand locally. Pure stands of Sonokling [*Dalbergia latifolia*] can be raised on suitable soils, which are mostly shallow. Thinnings of this species yield fuelwood and charcoal, and the final crop is suitable as furniture wood. About 1,000 ha. is destined to be planted with *Agathis*, which at first forms open stands and is therefore mixed with *Tarenna*. It is hoped eventually to obtain natural regeneration of *Agathis*. Other species are also under trial.

23.23. Sowings

23.23.1. *Seed Procurement, Treatment, and Testing*

23.23.1 : 12.25 : 23.1 : 12.11.21. SCHANTZ-HANSEN, T. **A study of Jack Pine seed.** *J. For.* 39, 1941 (980–90). [University of Minnesota.]

Germination tests of seed from cones collected in eight separate regions showed that:—(i) Cones produced in the two years previous to collection should give good seed for planting. (ii) The older cones can usefully be collected, for although there was a significant drop in germination after the seed was three years old, this was due in part to an increase in the number of empty seeds, which would be removed in large-scale extraction. Otherwise

considerable good seed was found in the oldest cones, a factor of importance in natural regeneration. (iii) There are considerable differences in the quality of seeds produced in different regions. (iv) Certain trees produce seed of poor quality apparently due to 'parthenospermy'. (v) There is no significant drop in moisture content of the cones after the first year for at least seven years. *From author's summary.*

23.23.11 : 12.26–8 : 12.11.21. GUARD, A. T., and WEAN, R. E. **Seed production in the Tulip Poplar.** *J. For.* 39, 1941 (1032–3). [Purdue University.]

Examination of seed of Tulip Poplar collected in six counties of southern and central Indiana from trees of different sizes down to 8 in. d.b.h., from trees growing in open and closed stands, and from trees growing on poor and on fertile soil, showed that none of these variables had a significant effect on germinative capacity. With reference to the effect of position of fruit on the tree it is concluded that seed from the upper two-thirds of the tree is slightly better than that from the lowest one-third. For individual fruits with samaras intact it was found that seed from the middle one-third was superior to that from the basal or upper fractions. [Cf. *For. Abs.* 2 (295).]

23.23.14 : 92 : 12.11.3 (75.8). MCKELLAR, A. D. **Georgia adopts forest seed law.** *J. For.* 39, 1941 (873–4). [University of Georgia.]

The 'Georgia Seed Law' of March, 1941, regulates the labelling and sale of seeds including certain forest tree seeds, which are restricted to Longleaf Pine, Slash Pine, Loblolly Pine, and Shortleaf Pine. 'Each container of forest tree seeds sold, or offered for sale, must bear a label showing: (1) State and county of origin, (2) name of collector, (3) date of collection including year and month, (4) technical generic and specific names in use by the U.S. Department of Agriculture, (5) purity of seeds expressed as the percentage by weight of whole normal seeds, and (6) germination percentage'. Farmers are permitted to sell seed in the county of origin without restriction.

23.23.15 : 12.26–8. ROTH, G. A tölgymakk hasznalati erteke. **[Silvicultural value of acorns.]** *Erdész. Lap.* 80, 1941 (64–9). [Hu.] Biol. Abs. 15 (19691).

Acorns may be germinated before sowing. Damage by *Balaninus* larvae can be reduced by treatments such as cooling, heating, or immersion.

23.23.19 : 12.25. HEIT, C. E., and ELIASON, E. J. **Coniferous tree seed testing and factors affecting germination and seed quality.** *Tech. Bull. N.Y. agric. Exp. Sta.* No. 255, 1940. pp. 45. [New York State Conservation Department.]

The results of 9 years' seed testing experience with 34 different species of coniferous tree seed are presented, including data on purity, viability, percentage of hollow seed, and number of seed per pound, together with the factors which influence them. The average germination percentage of conifers varied with the genera and species. Most *Pinus* showed between 70 and 90 per cent. viability, while *Larix* seldom gave over 50 per cent. Mature, filled seed freshly collected and properly extracted should be practically 100 per cent. viable, and any material reduction from this figure may be caused by various factors during collection, extraction and storage. Too early collecting, injuries during extraction, and poor storage were all found responsible for severe reduction in seed viability. Improper machinery and methods used in cleaning sometimes resulted in low purity and high percentage of empty seed. These empty seed reduced the viability and greatly increased the number of seed per pound in certain lots. Germination technic, to be successful, must vary according to the characteristics for the individual species. Moist prechilling is essential for certain *Pinus* and *Larix* species and for *Tsuga canadensis*, and may be desirable for other species. Daylight is necessary for a satisfactory test with some species and even artificial light may be essential to secure complete germination of certain *Pinus sylvestris* stocks. Temperature and moisture during germination are critical factors with some species. Alternating or cool temperatures were more stimulating to the dormant seed than constant or high temperatures. The longevity of most *Pinus* seed in ordinary dry storage exceeded that of other genera. The ideal long-time storage for all coniferous seed was found to be in a sealed container at a temperature of about 2° to 4° C., and with a moisture content not exceeding 5 to 8 per cent. *Authors' summary.*

23.23.19 : 23.26. FORBES, A. C. **Resulting tree stocks per lb. of seed. Extract from**

N.Z. Forest Service records, 1926–1939. *N.Z.J. For.* 4, 1940–41 (336).

A table shows the number of separate sowings, the quantity of seed and the number of seedlings obtained for planting per lb. of seed for twenty species of conifers over the period 1926–39.

23.23.19 : 23.26. FORBES, A. C. **Variations in the yield of forest tree seed per pound.** *N.Z. J. For.* 4, 1940–41 (337).

Data for twenty species of conifers (13 Pine) have been compiled from various sources.

23.24. Formation of Stands by Planting

23.24 : 12.25 : 12.19.3 : 12.26–8. MINCKLER, L. S. **Planting White Pine in Laurel and Rhododendron 'slicks'.** *J. For.* 39, 1941 (1036). [Appalachian For. Exp. Sta.]

For the successful establishment and emergence of planted White Pine the Laurel must be cut either in strips equal in width to three-fourths the height of the thicket or in spots of a diameter equal to the height of the thicket.

23.27. Arboriculture

23.27 : 12.26–8 : 47. WEISS, F., and BAUMHOFER, L. G. **Culture, diseases, and pests of the Box tree.** *Fmrs.' Bull. U.S. Dep. Agric.* No. 1855, 1940. pp. 17. [Bureau of Plant Industry.]

23.27 : 60.2 (54). SAGREIYA, K. P. **Ornamental trees: their planting and care.** *Cent. Prov. For. Bull., Nagpur* No. 4, 1941. pp. 69.

A semi-popular manual on ornamental trees suitable for the Central Provinces of India, with practical notes on their cultivation.

23.27 : 60.2 (77.2). HULL, R. B. **Trees: their planting and care.** *Ext. Bull. Purdue Univ.* No. 252, 1941. pp. 19.

A popular bulletin on arboriculture, with a list of trees recommended for landscape planting in Indiana.

23.3. *Afforestation*

23.3 (74.7) : 23.24 : 23.21 : 23.6 : 24. LITTLEFIELD, E. W. **Forest planting in New York: Instructions on obtaining nursery stock, methods of planting, and care of forest plantations.** *Bull. N.Y. Conserv. Dep.* No. 2, [1941?] pp. 33.

23.3 (921) : 12.25. BOTTENBURG, M. VAN, and GOVERS, A. Herbebossching met *Pinus merkusii* ter oostkust van Sumatra. [**Reforestation with *Pinus merkusii* on the east coast of Sumatra.**] *Tectona* 34, 1941 (583–678). [Du.e.]

Reforestation with *Pinus merkusii* was begun in the Lake Toba region, Sumatra, in 1929 and the planting of 13,150 acres at Aek Na Oeli was completed in 1940. On two further areas—Samosir and Toba Habinsaran—planting was started in 1938 and 1941 respectively. The total plantation area envisaged is about 50,000 acres. The present paper is a continuation of previous reports on the work and includes discussions of the planting organization and technique, thinning, future management, protection from fire and pests, and the possibilities of future exploitation for resin and pulpwood. Notes are also given on experimental work and on exotic conifers grown in eastern Sumatra. The planting system developed has made it possible to afforest 2,000–2,500 acres annually and is regarded as generally satisfactory, with the exception that the size of planting stock should be raised from 2–4 in. to 8–12 in., as the larger plants outgrow grasses and ferns faster and need less care than the smaller ones. The spacing of the plants has mostly been done at about 10 × 10 ft., giving about 440 trees per acre. With this spacing the first thinning should be made seven years after planting and should reduce the number of stems to 260 per acre. Fire is a serious menace to the young plantations and an active fire-protection system has been built up. It is estimated that an annual resin production of at least between 130 and 140 thousand cwts. would be needed to make resin manufacturing a sound business under Sumatran conditions and it is calculated that this annual production might be reached by 1956. If the Aek Na Oeli plantations were managed under the clear-cutting system on a rotation of 13 years, they should produce, from 1947 onwards, about 2,894,000 cu. ft. of pulpwood per annum, which would be sufficient to feed a mill with a daily capacity of 60 tons.

23.3 (922) : 97.1. MIJERS, W. N. Herbebossching op Madoera. [**Reforestation in Madura.**] *Tectona* 34, 1941 (505–6). [Du.]

According to the first topographical survey of Madura in 1878 the forests covered an area of about 70,000 ha., of which about 60,000 ha. were Teak forest. These forests, however,

have been disappearing rapidly through overcutting, and in 1939 a scheme was approved under which the reforestation of 20,590 ha. is to be undertaken. This will necessitate the purchase of 16,105 ha. of native land to supplement the available State land, and will have to be combined with emigration, as about 6,500 persons will be deprived of their farms. However, when the reforestation work is completed the forests should provide subsistence for 1,400–1,500 people. Reforestation is most urgently needed on marly soils.

23.4. *Formation of Forest by Natural Succession*

23.4 : 22.88.2 : 60 : 12.19.4 (66.9). ALLISON, P. A. **From farm to forest.** *Farm & Forest* 2, 1941 (95–8).

Report of a study of the natural regrowth of various ages on abandoned farm land in the Ondo Division, southern Nigeria. It appears that the farming of the normal rain forest in this region results in the establishment of a *Triplochiton/Celtis* association although the true rain-forest type may re-establish itself in time.

23.6. *Care of Regeneration in the Initial Stage of Establishment*

23.61 : 22.89. HOLMES, C. H. **Weeding in the Up-country Timber and Fuel-plantations.** *Trop. Agriculturist* 96, 1941 (274–94). L.S.

This note is concerned with weeding in the plantations of the Up-country Division [Ceylon] and experiments conducted in 1935–40 with a view to determining the minimum intensity, frequency, and period of weeding consistent with the satisfactory establishment of plantations in a reasonable time. Brief notes on the plantations, the historical background of the practice of clean weeding and a description of its nature are given, and average costs for the decade previous to the initiation of the experiments are estimated. The principal locality and climatic factors bearing on the question of the type of weeding likely to be most suitable are discussed. Results from 30 experimental plots, replicating 5 different treatments at 6 centres, are examined and summarized separately for reforestation and afforestation centres. All measurements have been statistically evaluated and given in summary form in tables. The main conclusions are:—(*a*) That the period of weeding ought under average conditions to be considerably shorter than in the past and need not generally be extended beyond 2 or at most 3 years. (*b*) That though clean weeding has generally given better results in the early life of plantations, it does not maintain this advantage over the lower grades of weeding even in the 5th year from planting. Even where it does maintain this advantage there are indications that the less-weeded plots are likely to overcome their initial handicap in time. (*c*) That strip-weeding in the 1st year and patch-weeding in the 2nd (if necessary in the 3rd) has in the main been no worse than clean weeding throughout, in the case of reforestation areas. This treatment is recommended in view of other advantages, principally of soil conservation and costs. (*d*) That clean weeding in the 1st year followed by strip-weeding in the 2nd has been no worse than continued clean weeding in the afforestation areas. For other reasons, principally for maintaining the already impoverished soil capital of the *patana* grasslands, this form of treatment ought to replace the present practice of clean weeding throughout the period of formation. (*e*) Total formation expenditure on weeding need be but a small fraction of what such cost appears to have been in the past. *From author's summary.*

24. TENDING OF STANDS AND TREES

24 : 12.26–8 : 22.89 : 22.6. MIRCHANDANI, T. K. **Treatment of Teak plantations.** *Indian For.* 67, 1941 (399–402).

Planting is the best means of securing Teak regeneration, but as the species is an extreme light demander and intolerant of crown friction it will not maintain a closed canopy beyond the sapling and young pole stages when grown as a pure crop, and owing to its deciduous habit the forest floor is exposed to sun and wind for 6–7 months of the year. An example of a proposed method of obtaining mixed stands without prejudice to the Teak is outlined on the basis of a 135-year rotation and initial spacing of Teak at 6 × 6 ft. The first two thinnings would be more or less mechanical, removing at least 50 per cent. of the trees each time, and the consequent opening of the canopy should induce regeneration of associated timber species partly by coppice and partly by seeding from neighbouring stands. With suitable practice in the following three thinnings, ending at the 55th year, it should be possible to bring the crop into an approach to natural mixed Teak forest,

except that the percentage and quality of the Teak should be higher in the planted stand. During this half of the rotation, strict fire protection would be needed to encourage the subsidiary species. In the second half of the rotation thinning would give way to selective cutting, in which sound associated trees would not be sacrificed for a badly formed Teak and only stems of exploitable diameter would be removed. On good sites the intermediate yields during the first half of the rotation should more than meet the cost of formation and interest charges, and comparatively inferior mixed Teak forest would have been converted into a high-value mixed Teak forest without creating unfavourable site conditions due to exposure.

24.2. *Thinnings*

24.2 : 12.25 : 57 : 76. KIAER, T. Bestandspleie. **[Stand treatment.]** *Tidsskr. Skogbr.* 48, 1940 (265–71). [Nor.] Biol. Abs. 15 (22599).

A 103-year-old stand of *Picea abies* at Solberg, treated by thinning from below, is compared with two similar 120-year-old stands near by. One of the latter was cut to a diameter limit in 1927 and 1940, and the other was untreated. The total wood yield of the first-named stand was 429 cu. m. per ha., and of the other stands 360 cu. m. and 386 cu. m., respectively, with about 50 per cent. greater money income from the first stand than from the others.

24.2 : 76 : 12.25. CONDIT, G. R., HUBERMAN, M. A., and MCGUIRE, J. R. **Collect the bounty on your wolf-trees.** *Tech. Note Ntheast. For. Exp. Sta.* No. 45, 1941. pp. 2.

Following a study of the problem of 'wolf-trees' in the White Pine region of the north-eastern United States it is recommended that under present market conditions such trees should be cut for boxboard logs and fuelwood, or alternatively the most undesirable trees may be girdled.

24.25 : 31.8 : 12.25 : 56.02. PAUL, B. H. **Thinning and quality: sudden acceleration of diameter growth in vertical and leaning Longleaf Pine trees in relation to quality of lumber.** *Sth. Lumberm.* 163 (2057), 1941 (203–6). [Forest Products Laboratory, Madison, Wis.]

The Longleaf Pine trees studied were on a good site and the sudden changes in growth rate following release were probably near the maximum for the species, and from the standpoint of crook, bow, twist, and cup, and other defects, did not appear to have a seriously detrimental effect upon the lumber of vertical trees. In leaning trees, however, even though the lean was no more than 2 degrees from the vertical, the formation of compression wood on the under side of the lean resulted in warping during drying, crook being the most serious type of deformation encountered. *From author's summary.*

24.3. *Opening of the Canopy. Release and Improvement Fellings*

24.3 : 32.1 : 31.8 : 57 : 12.25. THOMSON, W. G. **The influence of defect upon management of southwestern Ponderosa Pine stands.** *J. For.* 39, 1941 (849–53). [U.S. Forest Service.]

Based on data obtained from 1,010 Ponderosa Pine trees, representing all components of an average stand, a relation was established between age and vigour classes on the one hand and present gross and defect volume and mortality loss at the end of the 30-year cutting cycle on the other. From this it is possible to indicate the classes of trees that will produce a net growth over a 30-year period, and it is concluded that in order to remove all trees likely to suffer a net loss during that period it would be necessary to cut 50 per cent. of the net volume in the average stand, this amount being reduced in subsequent cutting cycles.

24.3 : 42.1 : 42.32 : 45.3 (43.1–5). HEYBEY, R. Die Zufallsnutzungen in den sächsischen Staatsforsten von 1800–1935 in ihrer regionalen und zeitlichen Verteilung. **[Salvage cuttings in the State forests of Saxony from 1800 to 1935: their regional and temporal distribution.]** *Thar. forstl. Jb.* 92, 1941 (508–25). [G.]

24.31 : 07.7. LIMING, F. G. **Two new girdling saws.** *J. For.* 39, 1941 (1029–32). [Central States Forest Exp. Sta.]

The saws described were designed specifically for removing a ring of Oak bark wide enough to prevent bridging, without severing the vessels in the sapwood. They are:—(*a*) A chain saw consisting of individual blades, 2 in. long, arranged in alternate 3- and 4-blade links held in position by washers and steel rivets. The blades are made of 1-in. band-saw

steel, each with six V-shaped teeth. (*b*) A saw made of five pruning-saw blades, the centre blade placed in the handle in the usual way, the outside blades attached to the outside of the handle, and the other two blades cut off just short of the handle, the blades being placed side by side, held in position with $\frac{3}{16}$-in. bolts, and separated by washers sufficiently to make an overall thickness of 1 in. The second type of saw is the more efficient of the two, particularly for trees 2 in. and more in diameter, while the chain saw is more efficient than an axe for girdling trees less than 4 in. in diameter.

24.4. *Shelterbelts. Windbreaks*

24.4. **Ten pointers on tree windbreaks.** *Ext. Leafl. Purdue Univ.* No. 189, (revised ed.) 1941. pp. 3.

With reference to the use, establishment and care of windbreaks of evergreen trees.

24.4. MARRITT, I. C. **An effective and economical method to prevent snow drifting on roads.** *For. Chron.* 17, 1941 (167–9). [Ontario Department of Lands & Forests.]

Suggestions are made on the use of trees planted in rows to act as shelterbelts or storm breaks.

24.4 : 60.2. WAHLBERG, H. E. **Windbreaks for orchard protection.** *Calif. Citrogr.* 26, 1941 (359, 372–3). L.S.

In Californian citrus orchards, both yield per acre and quality of fruit are materially improved by protection from wind, and in many areas windbreaks are essential to satisfactory production. Systematic planning of the tree belts, and hence more efficient protection, can be secured by community planting. Suggestions are made on the layout, planting and subsequent care of orchard windbreaks, including trimming, root pruning, irrigation and fertilization. The most popular and most effective windbreak tree is *Eucalyptus globulus*, either pure or mixed with species of Cypress. In pure plantings of *E. globulus* every second tree in the row is cut back almost to ground level after 3–4 years' growth, in order to promote suckering and branching to fill out the lower part of the windbreak.

24.5. *Pruning*

24.51 : 23.27 : 12.14.2. BLOCH, R. **Wound healing in higher plants.** *Bot. Rev.* 7, 1941 (110–46). [Yale University.]

27. TREATMENT OF EXCESSIVELY OPEN STANDS

27 (54.5) : 23.3 : 76. **The Jhok forest.** *Indian For.* 67, 1941 (509).

Numerous small forests consisting of scattered groups of *Dalbergia sissoo*, *Acacia arabica*, *A. modesta*, and *Morus alba*, mixed with shrubs and grasses, exist in the Punjab on alluvial land subject to periodical flooding. The little that has been done to demonstrate their possibilities has been successful, as witnessed by the example of the Jhok forest near Lahore. Stocking of this area with pure *D. sissoo* was begun in 1871, and by 1880 1,562 acres had been afforested. Since then the forest has been properly thinned and tended, and up to 1924, when fellings under the first working plan were started, it had yielded enough revenue to pay off all the capital cost and leave a net profit of Rs. 1,78,520 plus a growing forest valued at Rs. 4,84,220. Over the period 1871–1941 the net annual revenue has been Rs. 8 per acre.

3. FOREST UTILIZATION. FOREST TECHNOLOGY.

31. PROPERTIES AND ANATOMY OF WOOD

31.0. *General Information on Woods*

31.0 (54). TROTTER, H. **The common commercial timbers of India and their uses.** Manager of Publications, Delhi. [Revised ed.] 1941. pp. vii + iv + 234. [Forest Research Institute, Dehra Dun.]

Introductory chapters deal with the storage of logs and preliminary seasoning treatments; air seasoning, with simple instructions adapted to Indian conditions; kiln drying; and wood preservation. The bulk of the manual consists of accounts of the individual timbers, arranged in alphabetical order of botanical names and including information on names, characteristics, uses, sources of supply, and prices. In the last chapter the timbers are listed in groups under the particular uses for which they are suitable. There are two appendices, the first giving the comparative strength properties of the timbers in percentage of those of Teak, the second being an index to botanical and common names.

31.0 (54) : 12.25 : 12.26–8. LIMAYE, V. D. **Indian substitutes for Oregon Pine.** *Pamphl.* (*Timb. Testing Ser.*) *For. Res. Inst. India* No. 1, 1940. pp. 7. [Forest Research Institute, Dehra Dun.]

Indian timbers that can be substituted for Douglas Fir (Oregon Pine) are listed in separate tables for each of the major uses of the latter in India, and their weights and strengths are compared on a percentage basis with those of the American timber.

31.0 (66.7). MARSHALL, R. C. [Editor.] **Gold Coast timbers.** Govt. Printer, Accra. [1941.] pp. viii + 45 + iv.

Information is given on the distribution and frequency, wood characters, durability, impregnation, seasoning and working qualities, uses, supplies, and densities of the more important Gold Coast timbers.

31.0 (729.2). SWABEY, C. **The principal timbers of Jamaica.** *Bull. Dep. Sci. Agric. Jamaica* (*n.s.*) No. 29, 1941. pp. 37.

This bulletin includes a descriptive list of 117 timbers of Jamaica, giving in brief the size and growth habit of the tree, wood qualities, uses, and distribution. In addition there is a list of timbers classified according to use.

31.0 (729.9). STEHLÉ, H. Classification des essences forestières de la Martinique d'après leur utilisation. **[Classification of the tree species of Martinique according to their utilization.]** *Carib. For.* 3, 1941–42 (29–31). [F.e.span.]

A list of tree species classified under 15 heads according to their uses.

31.0 (931). NEW ZEALAND. **State Forest Service. Annual report of the Director of Forestry for the year ended 31st March, 1941.** Govt. Printer, Wellington. 1941. pp. 50.

The New-Zealand-grown timbers that are finding a wider use as all-time substitutes for imported timber include:—Tawa (*Beilschmiedia tawa*), which resembles *Fraxinus nigra* in appearance and mechanical properties, has a wide distribution, and is used as a substitute for imported Oak, promises to be a major plywood timber, and has already proven its use for clothes pegs, turnery, handles not subject to impact, etc.; Silver Beech (*Nothofagus menziesii*), which is first in production amongst indigenous hardwoods, has qualities that commend it for specialist uses such as rifle stocks and certain classes of pattern work; and Insignis Pine (*Pinus radiata*), which has a wide use in the boxing and crating industry, has replaced Californian Redwood and Western Red Cedar for flush-door cores and frames, and is being used in the manufacture of plywood and match splints (p. 30).

31.0 : 12.25 (7). BOULTON, E. H. B. **North American softwoods.** *Wood* 6, 1941 (297–302).

A brief description of the characteristics of the principal American softwood timbers.

31.0 : 12.25. BETTS, H. S. **American woods: Tamarack (*Larix laricina*).** U.S. Forest Service, Washington, D.C. 1940. pp. 6 + map & graph. P.R.

Data are presented on nomenclature, distribution and growth, supply, production for various uses, wood properties, and principal uses.

31.0 : 12.25. PERRY, R. S. **Sitka Spruce.** *Emp. For. J.* 20, 1941 (171–3). [Dominion Forest Service, Ottawa.]

This note deals briefly with the natural distribution of Sitka Spruce, the valuable properties and characteristics of its wood, and its many uses.

31.0 : 12.25. **Identification of woods: White Pine, *Pinus strobus*.** *Timber of Canada* 2 (1), 1941 (69–70).

A brief note on the size, uses, distribution and wood properties of *P. strobus*.

31.0 : 12.25. ELLIS, B. R. **Tidewater Red Cypress for industry.** *Sth. Lumberm.* 163 (2057), 1941 (149–56). [Southern Cypress Manufacturers' Association, Jacksonville, Fla.]

High resistance to decay and to chemical deterioration make Tidewater Red Cypress (*Taxodium distichum*) of particular value in many industries where these qualities are of first importance.

31.0 : 12.26–8. SCHLOMANN, A. F. **The properties of Iroko wood.** *Wood Products* 46 (12), 1941 (20, 48).

The properties of Iroko (*Chorophora excelsa*) wood qualify it for use as a substitute for Teak.

31.0 : 12.26–8. **Properties of Australian timbers: Brush Mahogany (*Geissois benthami* F.v.M.)** *Mon. News Lett. Div. For. Prod. Aust.* No. 118, 1941 (3).

31.0 : 12.26–8 : 33.8. BARRETT, L. I. **War revives an old industry: Appalachian**

forests are meeting the shortage of imported brier wood for American pipe smokers. *Amer. Forests* 47, 1941 (503–6, 543). [Appalachian Forest Exp. Sta.]

Root burls of *Kalmia latifolia* and *Rhododendron maxima* are now being used as a substitute for imported Brier root.

31.0 : 12.26–8. **The properties of Australian timbers: Yellow Carabeen (*Sloanea woolsii* F.v.M.).** *Mon. News Lett. Div. For. Prod. Aust.* No. 117, 1941 (3).

31.1. *Structure. Anatomy. Identification*

31.1 (71). HALE, J. D. **Identification of woods.** *Timber of Canada* 2 (1), 1941 (64–8, 71–4). [Forest Products Laboratories of Canada, Ottawa.]

Includes a brief description of characters that are used in distinguishing woods, and an identification key for the woods of softwood and hardwood species in common use in Canada.

31.1 : 12.25. WEST, W. I. **Structural variations in the closing membranes of pit-pairs in several coniferous woods.** *Univ. Wash. For. Cl. Quart.* 15 (1), 1941–42 (16–20).

The structure of the closing membrane in the bordered pit-pairs of certain coniferous woods [*Abies*, *Picea*, and *Tsuga* spp.] is characterized by a bar-like thickening which is revealed in thin radial sections under high magnification. Photomicrographs suggest that the portion of the closing membrane which bounds the torus is composed of individual or coalescent bars which radiate from the torus to the annulus, producing a striated appearance in the thinner portion of the closing membrane. Although photographic evidence indicates the presence of openings between the radiating bars of the closing membrane, positive ocular evidence is lacking; the photomicrographs strongly suggest, however, the existence of pores or perforations in that portion of the closing membrane. Previous work has shown the torus of the bordered pit-pairs in Douglas Fir (*Pseudotsuga taxifolia*) to be irregular in surface and outline. Similar characteristics have been found to exist in many other coniferous species. *Author's summary.*

31.1 : 12.25. MESSERI, A., and PECCIARINI, A. M. Ricerche sulla istologia del legno secondario delle Gymnospermae. I, *Araucaria cunningamii*, *Juniperus phoenicea*, *Taxodium distichum*. II, *Ginkgo biloba*. **[Investigations on the histology of the secondary wood of gymnosperms. I, *Araucaria cunning[h]amii*, *Juniperus phoenicea*, *Taxodium distichum*. II, *Ginkgo biloba*.]** *Nuovo Gior. Bot. Ital.* 47 (4), 1941 (675–88). [It.] Biol. Abs. 15 (24177).

31.1 : 12.25. TROCCHI, F. B. TA. Ricerche sulla istologia del legno secondario delle Gymnospermae. III, *Juniperus excelsa*. **[Investigations on the histology of the secondary wood of gymnosperms. III, *Juniperus excelsa*.]** *Nuovo Gior. Bot. Ital.* 47 (4), 1941 (693–7). [It.] Biol. Abs. 15 (24181).

31.1 : 12.25. CAPPELLINI, A. Ricerche sulla istologia del legno secondario delle Gymnospermae. IV, *Picea excelsa*. **[Investigations on the histology of the secondary wood of gymnosperms. IV, *Picea excelsa*. [*P. abies*].]** *Nuovo Gior. Bot. Ital.* 47 (4), 1941 (698–701). [It.] Biol. Abs. 15 (24173).

For each of the species named, data are presented on tracheid size, shape, and pitting.

31.1 : 12.25. AUSTRALIA. **Council for Scientific and Industrial Research. Division of Forest Products. Annual Report for 1940–41.** [Melbourne. 1941?] pp. 10.

A microscopic method has been developed for distinguishing Hoop Pine (*Araucaria cunninghamii*) from Bunya Pine (*A. bidwillii*) (p. 3).

31.1 : 12.25 : 33.32 : 12.11.3. LOMMATZSCH, H. Unterschiede zwischen Fichtenholz verschiedener Herkunft. **[Differences in Spruce wood of different origin.]** *Beih. bot. Zbl., Abt. A* 60, 1940 (97–134); *abstr.* in *Holz* 4, 1941 (261). [G.] P.R.

The structure of Spruce wood from Saxony, Norway, and Latvia was investigated to obtain data bearing upon its pulping properties. The German-grown wood showed the greatest variation in width of annual rings and tracheid length and was the most strongly lignified. The west-Norwegian wood was the least lignified and most uniform, and thus the most readily pulped. There also appeared to be differences in the cellulose obtained, the west-Norwegian material probably having longer molecules than the German-grown wood.

31.1 : 12.26–8 (923). PACHEO DE TÔRRES, J. Estudo de lenho de algumas espécies florestais de Timor. **[Study of the wood of some forest tree species of Timor.]** *Rev. Agron., Lisbon* 29, 1941 (56–86). [Port.] A.P.B.

Macro- and microscopic studies on the wood anatomy of *Parinarium corymbosum* Miq., *Intsia amboinensis* Thouars, *Pterocarpus blancoi* Merrill, *Canarium moluccanum* Bl.(?), *Garuga floribunda* Dcne., *Dysoxylum caulostachyum* Miq., *Melia dubia* Cav., *Dictyoneura* sp. (aff. *D. philippinensis* Radlk.), *Pometia pinnata* Forst., *Sterculia foetida* L., *Calophyllum inophyllum* L., *Terminalia catappa* L., and *Memecylon* sp. The paper includes 39 photomicrographs.

31.1 : 12.26–8 (7 : 8). RECORD, S. J. **American woods of the family Flacourtiaceae.** *Trop. Woods* No. 68, 1941 (40–57).

Descriptions of the woods of the various genera, with notes on uses, common names, and distribution.

31.1 : 31.2. FEGEL, A. C. **Comparative anatomy and varying physical properties of trunk, branch, and root wood in certain northeastern trees.** *Tech. Publ. N.Y. St. Coll. For.* No. 55, 1941. pp. 20.

Twenty tree species—12 hardwoods and 8 conifers—were included in this study. Results are summarized as follows:—(1) Wood of the highest specific gravity occurs in the branches of the trees examined. The roots produce the lightest wood. (2) Shrinkage in drying is greatest in branch wood and least in root wood. (3) Branch wood is stronger in compression perpendicular to the grain than either trunk or root wood. Material from the root is much weaker in this respect than either branch or trunk wood. (4) The branches are strongest in compression parallel to the grain when green; the roots are weakest. When air-dried, trunk wood is the stronger; root wood is inferior both in the green and air-dry conditions. Corrections made for differences in specific gravity indicate that trunk wood is more efficient in compression parallel to the grain than either root or branch wood. (5) Static bending tests point to trunk wood as superior to both root and branch wood in stiffness and bending strength. Branch wood is usually tougher than that of the root and trunk. Root wood is weaker, in all respects, than wood from the trunk and branch. (6) The branches of the conifers and hardwoods studied grow more slowly than the roots. The trunks develop most rapidly. (7) The vessel volume of the hardwood species studied is highest in the trunk and lowest in the roots. The branches have the most numerous and the smallest vessels; roots, the least numerous and largest. (8) The broadest fibers in hardwoods are found in the roots; those in the branches are very small in comparison with those of the trunk and root. (9) In the conifers the broadest tracheids are found in the roots; those of least diameter in the branches. (10) The shortest wood fibers, vessel segments, and tracheids are found in branches. The longest elements usually occur in the trunk, although some species produce longer cells in the root (e.g. the root tracheids of the White and Red Pines are longer than the tracheids in either the trunks or branches). (11) Resin canals, when normally present in the trunk, occur also in the roots and branches. They are smaller and more numerous in branches than in other parts of the tree. Resin canals are less numerous in roots than in the trunk, and are of about the same size as those in the trunk. (12) Wood rays are more numerous in branches than in trunks and roots, both in conifers and hardwoods. They are least frequent in the trunks of the hardwoods and the roots of the conifers. The largest ray volume in hardwoods occurs in roots, while the trunk has the lowest ray volume. There is no significant difference between the ray volumes of roots, trunks, and branches in conifers. *Author's summary.*

31.1 : 56.02 : 07.7. HESS, R. W. **A micrometer for growth ring analysis.** *J. For.* 39, 1941 (871–3). [Yale University.]

Describes the construction and use of an instrument that incorporates a double micrometer and a moving object slide and has been developed to facilitate the accurate measurement of alternating bands of springwood and summerwood. Measurements are accurate to $\frac{1}{5,000}$ in. and measuring points can be accurately selected by means of a magnified image of the cross-section of the specimen. Accumulated measurements of springwood and summerwood from the micrometer scales of the instrument can be converted directly to percentages of summerwood by means of a simple alinement chart.

31.2. *Physical Properties*

31.2 : 12.26–8 : 31.0. WALKER, F. S. **Resak Daun Runching and Resak Mempening: *Vatica cuspidata* (Ridl.) Sym., and *V. Stapfiana* (King) V. Sl. Timber Test Sheet No. 32.** *Malay. For.* 10, 1941 (150–5).

Data on woodworking characteristics, description of timber, defects, physical and mechanical properties, seasoning properties, and durability and amenability to preservative treatment. Timber of *V. cuspidata* can safely be used for heavy constructional purposes, but is likely to check unless carefully seasoned; that of *V. stapfiana* is suitable for medium-heavy constructional purposes, but the small size of the tree limits its uses. Both timbers are suitable for house posts and are popular for this purpose.

31.22. Relation to Water, Air, Gases

31.22.1 : 07.7 : 33.36.3. SEGELKEN, J. G., and MASON, M. S. **An electrical test for moisture content in seasoned untreated round Southern-Pine timbers.** [With discussion.] *Proc. Amer. Wood Pres. Ass.* 37, 1941 (353–65). [Bell Telephone Laboratories, Inc., New York.]

An electric apparatus has been specially designed for use in determining the moisture content of round Southern Pine timbers under conditions where a moisture gradient from a relatively low moisture content to a relatively high moisture content will exist in nearly every piece of timber, in particular the periodic checking of moisture or rate of drying of poles and piles. The apparatus and its method of operation are described.

31.22.1 : 33.36. DEERY, H. L. **Equilibrium moisture content of salt-treated wood.** *Tech. Publ. N.Y. St. Coll. For.* No. 58, 1941. pp. 15.

Curves showing for a fixed temperature the average moisture content of wood in moisture equilibrium with the atmosphere at different relative humidities are given for (i) Ponderosa Pine samples impregnated with diammonium phosphate, chromated zinc chloride, and zinc chloride, under conditions such that equilibrium was reached by water loss from the wood; and (ii) Ponderosa Pine and Basswood samples impregnated with diammonium phosphate or zinc chloride, under conditions such that equilibrium was reached by the uptake of water from the atmosphere. Curves are also presented for control samples under like conditions. The equilibrium moisture content of treated wood was almost uniformly above that of the controls, but at relative humidities below 70–80 per cent. the differences were not great and the curves obtained were very similar, indicating that within the lower relative humidity range the natural affinity of the wood for water plays the most important part. Above 70–80 per cent. relative humidity the hygroscopicity of the salts becomes the dominant factor and the moisture content of treated wood becomes progressively higher than that of untreated material. Experimental technique is described and various details of the results are discussed.

31.22.3 : 12.11.12. JOHNSON, J. W. **Silver nitrate as a stain for use in studies of conduction of liquids in wood.** *Phytopathology* 31, 1941 (1035–9). [Ohio State University, Columbus.]

By using a 2½-per-cent. solution of silver nitrate in 20-per-cent. ethyl alcohol and developing immediately after injection was complete with elonhydroquinone developer, followed by fixing in acid hypo, it was possible to demonstrate and preserve clearly the pattern of primary longitudinal conduction of liquids in wood, uncomplicated by lateral diffusion. Procedure designed for use in a field laboratory is outlined, but further refinements might well be possible under proper laboratory conditions.

31.23. Weight. Specific Gravity

31.23. RIETH, K. Volumgewichtsbestimmungen von Holz. **[Determinations of the density of wood.]** *Papierfabrikant* 39, 1941 (246–7). [G.] P.R.

100 g. of oven-dry wood chips coated with paraffin are placed in a special measuring flask ('Spezimeter') together with a standard volume of water. The neck of the flask is so calibrated that the specific gravity of the wood can be read off directly from the height of the water column.

31.25. Hardness

31.25 : 33.12. HARRAR, E. S. **Some physical properties of modern cabinet woods—I. Hardness.** *Trop. Woods* No. 68, 1941 (1–11). [School of Forestry, Duke University.]

A table is given of hardness values (each the average of 100 tests) for 85 woods used in the American furniture industry; moisture content and specific gravity are specified for each series of tests, and hardness is stated both as the actual test value and, for comparison, in percentage of the hardness of American Black Walnut.

31.25 : 33.4. **Service test on flooring timbers.** *Wood* 6, 1941 (291–6).

With the development of the laboratory abrasion test, designed at the Forest Products Research Laboratory, Princes Risborough, to determine the relative resistance to wear of flooring timbers, a service test was needed to correlate wear in service with duration under the laboratory test. Specimen floorings of European Oak (*Quercus* spp.), Canadian Yellow Birch (*Betula lutea*), Rock Maple (*Acer saccharum*), Jarrah (*Eucalyptus marginata*), Tasmanian Oak (*Eucalyptus* spp.), and Gurjun (*Dipterocarpus* spp.) were laid in the traffic ways of an underground station in London. Owing to the outbreak of war the tests could be completed only for Tasmanian Oak. The results of the completed tests show that the wear produced under service conditions is similar to that reproduced in the laboratory abrasion test. The development of the breakdown follows similar lines and the ultimate surface disintegration is the same in each case. Although the experiments with the remaining five species are incomplete, the behaviour of each under service conditions confirms results obtained at intermediate stages in previous laboratory tests. Wear and breakdown characteristics of these timbers in the abrasion tests are closely reproduced under service conditions.

31.27. Mechanical Strength

31.27 : 12.25. KANO, G. **Variation in bending strength within the individual stem of *Chamaecyparis obtusa* Sieb. et Zucc. in Taiwan.** *J. Taihoku Soc. Agr. & For.* 5 (2), 1941 (105–15). [Jap.] Pl. Sci. Lit. 14 (20), (9).

31.27 : 12.26–8. PANSHIN, A. J. **Strength properties of Chinese Elm grown in Michigan.** *Quart. Bull. Mich. agric. Exp. Sta.* 24, 1941 (115–7).

The wood of Chinese Elm (*Ulmus pumila*) is described briefly and results are given of tests for static bending, compression parallel to grain, shear parallel to grain, and hardness. The results are compared with the average values for these strength properties of the three species of Elm native to the United States.

31.27 : 33.51 : 12.26–8. TRANSVAAL. **Transvaal Chamber of Mines Timber Research Laboratory annual report 1940.** Johannesburg. 1941. pp. 22.

Results from the investigation of underground supports in mines showed that:—(i) Wooden poles of certain species above 9 in. in diameter withstand greater loads than concrete discs 24 in. in diameter, and are equally as satisfactory as the latter for most purposes. (ii) A definite correlation exists between diameter of pole and maximum load supported. Wattle (*Acacia mollissima*) is superior to Saligna (*Eucalyptus saligna*) in poles up to 10 in. diameter but this relation is reversed in larger poles. (iii) Saligna is superior to Wattle for cushioning. (iv) Wattle packs are superior to Saligna packs in load/compression ratios and Wattle timber is more effective in taking loads where pressure is severe (pp. 5–9).

31.3. *Chemical Properties*

31.3 : 12.25 : 31.8. ANDERSON, E., KESSELMAN, J., and BENNETT, E. C. **Polyuronide hemicelluloses isolated from sap-wood and compression wood of White Pine, *Pinus strobus*, L.** *J. biol. Chem.* 140, 1941 (563–8). [University of Arizona, Tucson.] L.S.

31.3 : 33.32. SCHÜTZ, F. Untersuchung der beim Holzaufschluss mit wasserhaltiger Chloressigsäure entstehenden Lignine. **[Investigation of the lignins resulting from the pulping of wood with aqueous chloracetic acid.]** *Cellulosechemie* 19, 1941 (87–9). [G.] [Hauptlaboratorium der Feldmühle, Papier- und Zellstoffwerke A.G.] P.R.

31.3 : 33.32 : 12.25. LAUTSCH, W. Über die oxydative und hydrierende Destruktion des Holzes, des Lignins und der schwefelhaltigen Ablaugen der Fichte. **[On the oxidative and hydrogenative destruction of the wood, lignin and sulphur-containing waste liquors of Spruce.]** *Cellulosechemie* 19, 1941 (69–87). [G.] [Institut für die Chemie des Holzes und der Polysaccharide, Chemisches Institut der Universität, Heidelberg.] P.R.

31.3 : 33.32 : 12.25. AHLM, C. E. **An investigation of Spruce thiolignin.** *Paper Tr. J.* 113 (13), 1941 (115–8). [Sorg Paper Co., Middletown, Ohio.] P.R.

31.3 : 33.39 : 33.32 : 12.25. FREUDENBERG, K., PLOETZ, T., and DUMPERT, G. Stufenweise Hydrolyse von Fichtenholz. **[Hydrolysis of Spruce wood by successive stages.]** *Cellulosechemie* 19, 1941 (89–91). [G.] [Institut für die Chemie des Holzes und der Polysaccharide, Chemisches Institut der Universität Heidelberg.] P.R.

31.4. *Durability. Decomposition*

31.42. Attack by Plant Organisms

31.42.11 : 12.21 : 44.3. LOHWAG, K. Untersuchungen über die Holzzerstörung durch *Fomes hartigii* (Allesch.) Sacc. et Trav. und *Fomes robustus* Karst. **[Studies on wood destruction by *Fomes hartigii* (Allesch.) Sacc. & Trav. and *Fomes robustus* Karst.]** *Z. PflKrankh.* 50, 1940 (481–94); *Zbl. Bakt.*, Abt. 2, 103, 1941 (407). [G.] R.A.M. 21 (56).

F. hartigii, one of the commonest parasites of *Abies alba*, invades the wood through the medullary rays, whence it passes into the tracheids, the upper and lower parts of which are both rapidly permeated by the hyphae. Penetration of the cell walls is accompanied by dissolution of the lignin, but the fungus also disintegrates cellulose and pectins by its enzymes, so that direct contact between the hyphae and the cell walls is not necessary. 'Lines of demarcation', consisting of brown hyphal agglomerations, are visible in the infected wood. *F. robustus* in Oak wood develops initially in the vessels, in which most of the hyphae are found even at an advanced stage of infection. The walls of the vessels withstand the attack of the fungus, to which the surrounding parenchyma cells and wood fibres succumb completely.

31.42.11 : 31.1. PROCTOR, P. **Penetration of the walls of wood cells by the hyphae of wood-destroying fungi.** *Bull. Yale Univ. Sch. For.* No. 47, 1941. pp. 31 + plates.

From the evidence obtained in this study it is concluded that penetration of the walls of wood cells by the hyphae of wood-destroying fungi is accomplished by (i) the secretion of enzymes at the tips of penetrating hyphae, and (ii) the total local dissolution of the cell wall by enzymic activity in advance of actual passage through the wall. Thus penetration is effected through a previously formed passage without actual contact between the hypha and the wall, except possibly that contact with the wall at the very first point of penetration may be the stimulus that excites enzymic activity. Careful examination of hundreds of 'bore holes' failed to give any evidence that mechanical force is instrumental in penetration, though at present the possible existence of penetration by such means cannot be disproved. The results are based on examinations of sections from an extensive series of samples from 4 species of coniferous woods decayed by pure cultures of 6 species of wood-destroying fungi. A full account is given of the very careful technique required in such a study, and numerous photomicrographs are appended, some showing—for the first time so far as known—the actual process of penetration. [Cf. preceding abstract.]

31.42.11 : 33.51. MAIZE, E. R., SCHEFFER, T. C., and GREENWALD, H. P. **A study of timber decay in Crucible Mine of the Crucible Fuel Co.** *Report of Investigations, U.S. Bureau of Mines* No. 3544, 1941. pp. 17.

Posts of Cherry, Maple and Oak were sawn longitudinally, one of each pair of halves was coated with limestone dust, and the halves were placed in the mine for exposure to decay. Results after 18 months' exposure suggest that rock dusting increased decay to some extent, but further tests are needed for confirmation.

31.42.12 : 33.36.1. VERRALL, A. F. **Dissemination of fungi that stain logs and lumber.** *J. agric. Res.* 63, 1941 (549–58). [Bureau of Plant Industry, U.S.D.A.] O.R.E.

Staining fungi are disseminated by means of air currents, insects, milling machinery, rain water, and the transport of infected wood. Of the important staining fungi, *Ceratostomella pilifera*, *C. ips*, *C. pluriannulata*, *Endoconidiophora caerulescens*, *Graphium rigidum*, and *Diplodia natalensis* were found to be carried by air and insects; *C. pilifera*, *C. ips*, *C. pluriannulata*, *E. caerulescens*, and *G. rigidum* by milling machinery; and *C. pilifera*, *C. ips*, *E. caerulescens*, and *D. natalensis* by the transport of infected wood. *C. ips* and probably *C. pini* are disseminated mostly by the bark beetles with which they are specifically associated. Most of these methods of dissemination have become less important now that chemical treatments and well-constructed seasoning piles are in common use. However, ambrosia beetles and bark beetles remain of practical importance as carriers of staining fungi. Bark beetles are important mainly in inoculating Pine logs, and ambrosia beetles in inoculating hardwood logs. Ambrosia beetles also attack green lumber of species most susceptible to staining, inoculating it below protective surface chemicals. Indications are that none of the commercial stain-control chemicals in common use has any repellent effect upon ambrosia and bark beetles. Dissemination by the transport of

infected wood may be important in causing 'sticker stain', if stained green stickers are used in seasoning piles.

31.43. Attack by Animal Organisms

31.43 (59.1) : 33.36.1. GARTHWAITE, P. F. **A guide to the borers of commercial timber in Burma.** Supt., Govt. Printing & Stationery, Rangoon. 1940. pp. 33 + plates. P.R.

Information on the biology and control of timber borers is presented under the headings:— (i) borers of living trees; (ii) borers of felled trees; (iii) borers of converted timber; (iv) termites; and (v) marine borers. There are two appendices: the first for distinguishing attack by powder post beetles, pinhole borers, and furniture beetles; the second a list of borers of some commercial timbers in Burma, arranged by timber species.

31.43 : 45.3 : 13.2 (52). SHIMIZU, T. **Beetles boring into timbers in Japan.** *Nojikairyo-shiryo Minist. Agric. Japan* No. 152, 1940 (133–46). [Jap.] R.A.E. A30 (13).

Lists are given from the literature of Coleoptera recorded as boring in trees in Japan, arranged under the trees attacked.

31.45. Injury by Fire

31.45 : 33.15. **And now—'fireproof plywood'.** *Timber of Canada* 2 (1), 1941 (162, 164).

A new fireproof plywood (Plybesto) is described in which the fireproof agents are added to the glue line. In blow-torch tests this plywood showed failure after 60–65 minutes compared with 50–55 seconds and 6–8 minutes respectively for two wallboards marketed as 'fireproof'. The plywood is a good insulator and the 'fireproof-bonding-glue mix' (Cumbestex) can be used externally for fireproofing exposed surfaces.

31.8. *Quality and Defects of Timber*

31.8. TIEMANN, H. D. **Ripples in lumber—what causes them?** *Sth. Lumberm.* 163 (2057), 1941 (288, 290).

An explanation is given for the ripples produced on a board by waves of vibration travelling along a band saw. Ripples may also be caused by wavy grain, giving an effect known as 'fiddleback'.

31.8 : 12.25 : 45.3 : 13.2. SPURR, S. H., and FRIEND, R. B. **Compression wood in weeviled Northern White Pine.** *J. For.* 39, 1941 (1005–6).

As one of the uppermost lateral branches swings up to take the place of a White Pine leader killed by the weevil (*Pissodes strobi*), two regions of stress are formed in the bole, the most important of which is at the weeviled node on the side of the pith line opposite the original killed leader. Compression wood develops in this region and may cause a serious defect in the lumber sawn from the centre of the log. The horizontal extent of compression wood formed was found to be roughly equal to the pith offset at the weeviled node.

31.8 : 12.26–8. AUSTRALIA. **Council for Scientific and Industrial Research. Division of Forest Products. Annual report for 1940–41.** [Melbourne. 1941?] pp. 10.

In an investigation of tension wood in Blackwood (*Acacia melanoxylon*) the area of tension wood observed was found to correspond closely with an area of brittle heart (p. 3).

31.8 : 31.21.33. TIEMANN, H. D. **What is 'spiral grain'?** *Sth. Lumberm.* 163 (2055), 1941 (55–7).

'Spiral grain' is the result of individual fibres sloping spirally around the log. Such a log may appear to be straight-grained if the annual rings have developed parallel to its axis and the spiral grain can be detected only by determining the slope of the fibres in the tangential direction. In growing trees it may be apparent from the twist in the trunk and in drying logs from the direction of checking. 'Interlocking grain' results when the spiral of the fibres reverses its direction from period to period of growth. This makes for a tough log that is hard to split. The cause of spiral grain in trees is not known, though it appears to be hereditary to some extent. [Cf. *Indian For. Rec.* 21 (2), 1925.]

32. HARVESTING OF WOOD. LOGGING

32 : 12.26–8 : 22.82 : 57 : 76.1 : 98. WILLSCHER, O. Die Nutzung von Reinbeständen des Schirmbaumes (*Musanga smithii* R. Br.). Planungsvorschläge auf Grund eigener in Kamerun gewonnener Erfahrungen. [**The exploitation of pure stands of the Umbrella Tree (*Musanga smithii*). Proposals for planning, based on personal experience in the Cameroons.**] *Kolonialforstl. Mitt.* 3, 1940

(12–34); *abstr.* in *Forstarchiv* 17, 1941 (212). [G.]

Reference is made to the rapid growth and good yield of *Musanga smithii* and to its potential utility as a pulpwood and for veneer cores, box boards, etc. [Cf. *For. Abs.* 1 (27).] The author's personal experience of the logging of this species in the Cameroons is described; the planning and costs of exploitation are discussed; and it is concluded that the wood could be shipped to Germany for sale at 10–11 RM per cu. m., at which price it could compete with German-grown Spruce costing 12 RM per cu. m. (pre-war prices).

32 : 33.02 : 76.1 : 82. JENSEN, V. S. **Pulpwood production costs on small operations in the upper Connecticut River Valley.** *J. For.* 39, 1941 (991–3). [Northeastern Forest Exp. Sta.]

A time study was made of the various phases of a pulpwood (clear-cutting) operation, including felling, limbing and peeling, crosscutting, piling, skidding, yarding, and trucking. Tree size was found to be the major factor affecting per-cord costs of pulpwood, in particular the per-cord time for production decreased rapidly for size classes from 5-in. up to 8-in. diameter, though this relation was least noticeable for the operations of limbing and skidding. The effect of tree size on production time per cord of peeled Spruce pulpwood for each operation is shown graphically. It was found that one man working alone was more efficient than two men at felling, limbing, peeling and crosscutting, and that for the first three operations a three-man crew was the least effective unit. Furthermore, the felling, peeling and crosscutting of Spruce required slightly more time than that of Balsam Fir.

32.1. *Marking of Trees and Coupes*

32.1 : 07.7. WACKERMAN, A. E. **Methods of marking trees to cut in logging.** *Sth. Lumberm.* 163 (2055), 1941 (49–53).

Methods include axe blazing and marking with paint. The former should be used only on trees to be cut, the latter can be used on trees to be left, such as seed trees. Paint markings can be changed if necessary. Paint can be applied by brush or preferably by paint gun. [Cf. *For. Abs.* 1 (177), 3 (56).]

32.1 : 22.14.2. WACKERMAN, A. E. **Factors affecting selection of trees to cut in logging.** *Sth. Lumberm.* 163 (2053), 1941 (49–51).

Three factors that are directly concerned with the trees themselves—the species, size, and quality of tree—have an important influence on cost of logging, cost of manufacturing logs, and on the selling price of lumber, and each of these factors must be considered in determining the marginal tree for cutting. Also the type of operation, whether liquidating or permanent, should have a definite effect on the selection of trees to be cut.

32.2. *Felling and Related Operations*

32.2 : 07.7. ARO, P., BRANDER, J., and WILLMAN, H. J. Gerätemerkblatt für Waldarbeiter. **[Manual on tools for forest workers.]** Kirjapaino-Osakeyhtiö Lause, Helsinki. 1940. pp. 55. [Fi.] *Review* in *Forstarchiv* 17, 1941 (303–5). [G.]

In this review brief descriptions are given of logging tools used in Finland, including axes, saws, barking and skidding tools. There are illustrations of an axe, a wood-framed bow-saw, a simple tool for 'planing' off the tips of saw teeth, a barking spud, a drawknife for barking, and skidding tongs.

32.25 : 07.7. Méthodes recommandées pour le limage des lames de scies à bois et pour l'emploi des nouveaux outils perfectionnés pour cet usage. **[Methods recommended for the filing of blades of wood saws and for the use of new tools specially adapted to this purpose.]** *La Forêt Québecoise* 3 (10), 1941–42 (6–8). [F.]

32.25 : 82 : 33.02 : 22.14.2. HOUGH, A. F. **Pulpwood piece cutters profit by selective cutting.** *Tech. Note Allegh. For. Exp. Sta.* No. 31, 1941. p. 1.

It is shown that pulpwood cutters, working in a 43-year-old hardwood stand with trees up to 17 in. d.b.h., can produce 1·9 times as much solid pulpwood per day from trees 11 in. and up as from trees 5 to 8 in. d.b.h.

32.25.2. WACKERMAN, A. E. **Felling trees in logging.** *Sth. Lumberm.* 163 (2057), 1941 (281–5).

Detailed consideration of tree felling, particularly as practised in the southern United States, the factors discussed being (*a*) direction of fall, (*b*) undercutting, and (*c*) stump height.

32.25.2 : 46 : 07.7. RECKE, GRAF V. D. Der Mochower Fällbock. **[The Mochow 'felling trestle'.]** *Forstarchiv* 17, 1941 (296–7). [G.]

Description of a simple portable trestle designed to minimize damage to regeneration in underplanted stands when felling old trees. The trestle is placed in such a manner that it is hit by the lower portion of the crown of the felled tree.

32.25.4 : 07.7. **A circular saw without a shaft.** *Aust. For.* 6, 1941 (35–6).

The range of usefulness of an ordinary circular saw with regard to the depth of cut obtainable is restricted by the limit beyond which the diameter of the blade cannot be increased without too great a sacrifice of rigidity. In spite of their great cutting capacity, ordinary circular saws are therefore unsuitable for such purposes as the crosscutting of bulky timber. However, a French firm, Etablissements Neyrod, of Villeurbanne (Rhône), has now designed a crosscut saw that operates on the 'centreless' principle, combining a great diameter of the blade with satisfactory rigidity. The blade is an annular disc and is centred on a stationary disc secured in a semicircular frame. Lateral guidance of the blade is effected by means of a tongue on its internal periphery running in a corresponding groove in the stationary disc. The blade is driven by two friction pulleys which rotate in opposite directions and give it a speed of about 450 r.p.m. The power is supplied by an electric motor or a petrol engine. Saw and motor are mounted on a carriage, and can be lowered by means of a handle as the depth of the cut increases. With a centreless crosscut saw having a diameter of 650 mm. a tree trunk 500 mm. in diameter can be sawn through in about five seconds. The power consumption is 3 h.p.

32.25.5 : 07.7 : 33.02. **The barking of long logs in saw-log form.** *Pulp Paper Mag. Can.* 42, 1941 (776).

Reference is made to three types of barking machines. Two of these, the Hillbom and Orrmell, are built and adapted for sawmill logs. In the Orrmell machine the feeding of logs is continuous, a mixture of logs of different lengths can be barked, and a log can be kept individually in the apparatus until satisfactorily cleaned. The capacity of this machine for Scandinavian wood is 350–450 logs per hour for Pine and 250–350 logs per hour for Spruce.

32.29.1 : 07.7 : 82. GLÄSER, H., and NATLACEN, F. Das Spalten von Kiefernstockholz mit Hilfe von Presslufthämmern. **[The cleaving of Pine stumpwood with the aid of compressed-air hammers.]** *Forstarchiv* 16, 1940 (249–56); *abstr.* in *Holz* 4, 1941 (263). [G.] P.R.

Experiments have shown that this method of conversion can be used with success. On a coupe of about 1 ha. with stumps 30–35 cm. in diameter there are about 75 stacked cu. m. of stumpwood. Manual conversion would cost 225 RM., and would require 6–7 workmen and 9–12 working days. Using the compressed-air hammer, the costs, including fuel and amortisation, amount to 198·75 RM., and the work can be done by 4 men in 6–7 days.

32.29.1 : 07.7. GLÄSER, H., and NATLACEN, F. Prüfung von Rodegeräten. **[Trials of stump-grubbing implements.]** *Forstarchiv* 17, 1941 (291–6). [G.]

Data on the labour cost (cost of manual labour and, in some cases, also of horse labour) of grubbing 1 stacked cu. m. of stumpwood using 9 makes of German implements priced from 280 to 3,000 RM. In general, implements with a vertical pull showed approximately equal efficiency whether the stumps were fresh or old, while implements with a lateral pull were more satisfactory with old than with fresh stumps.

32.29.1 : 07.7. BOKOR, R. Egy újfajta húzólag működö irtógép. **[A new stump-grubbing machine.]** *Erdész. Lap.* 80, 1941 (358–62). [Hu.g.f.e.]

The German 'Ostmark' machine, which is worked by two men, is claimed to allow of developing a traction force of 40,000 kg.

32.8. *Grading and Storage of Wood in the Rough*

32.81 : 12.26–8. BENSON, A. O. **Grading hardwood logs by the cutting system.** *Sth. Lumberm.* 163 (2057), 1941 (226–8). [Forest Products Laboratory, Madison, Wis.]

Grading specifications have been drawn up for certain northern (U.S.) hardwood species based on an analysis of characteristics of logs grouped according to lumber yield in the mill. Grades are based on log length and diameter, permissible cull and sweep, and the cutting yields apparent on each of three surfaces of the log. The specifications segregate logs into quality classes having differences in value that

are of practical significance. [Cf. *For. Abs.* 2 (147).]

32.9. *Transport*

32.91.1 : 76.1. SCOTT, W. E. **Cheaper logs by skidding both down hill and up hill.** *J. For.* 39, 1941 (843–8).

The relative cost of logging is determined by costs of road construction and of skidding. When skidding with tractor is done both downhill and up-hill to the same landing the spacing of roads is widened and under certain conditions the decrease in cost of road construction more than compensates for the increased cost with up-hill skidding. Formulae are presented with which to determine comparative costs and the most economical size and shape of the area to be served by a landing on both level and sloping ground.

32.91.12 : 32.91.22. HOYLE, R. J. **Motorized logging equipment means better forestry practice.** *Sth. Lumberm.* 163 (2057), 1941 (295–8). [New York State College of Forestry.]

A note on motor equipment, including particularly bulldozers, tractors and arch equipment, that is in use in the United States in forest road building and skidding. It is pointed out that a forest equipped with a road system is accessible in case of emergency, that good, low-cost roads can maintain a year-round log supply to the mill, that motorized equipment results in lower operating costs and this, together with permanent or semi-permanent roads, can result in better forest management.

32.91.12 : 32.96 : 33.02. FLATT, F. L. **Pre-hauling eight-foot wood.** *Pulp Paper Mag. Can.* 42, 1941 (788–93). [Spruce Falls Power & Paper Co.]

Description of a method of loading 8-ft. wood on sloops for transportation from cutting site to the main hauling road, using tractors and loading chains, and of transferring wood from sloops to hauling sleighs by means of a swinging-boom jammer powered by a D6 tractor and double drum. Factors affecting the production capacity of this method are noted.

32.91.12 : 82 : 76.1. GODWIN, G. **Time and cost analysis in sulky logging.** *Pulp Paper Mag. Can.* 42, 1941 (794–6). [Quebec North Shore Paper Co.]

The costs of any motive power in logging include both fixed and variable costs, fixed time costs being higher for tractor than for horse and the variable time costs being lower. By equating fixed and variable horse costs with similar tractor costs it is possible to determine the distance at which horse logging should give way to tractor logging. Analysis of data from an operation indicates that where the ground permits a tractor to proceed at 200 ft. per min. it is cheaper to eliminate horse skidding and use tractor direct to bunched timber at felling site. However, where such tractor logging requires more road construction the factors affecting the economic spacing of roads must be considered. The value of good roads in sulky operations is emphasized.

32.91.22 : 07.7. THORENAAR, A. Karren op luchtbanden. **[Carts on pneumatic tires.]** *Tectona* 34, 1941 (775–8). [Du.]

Notes on experience with 2- and 4-wheeled timber carts built up on old motor or lorry axles and drawn by coolies or oxen. Requisites for the successful use of these are that a park should be available, where servicing and inspection can take place, as the coolies cannot be relied upon to keep the tires in good condition; that correct air pressure should be maintained and a liberal margin allowed between the permitted load and the maximum load specified by the tire manufacturers; and that tires should be new and of types made for heavy duty. Where a hard road is available, the 4-wheeled cart is probably better than the 2-wheeled.

32.91.22 : 07.7. HOLMSTROM, J. **Truck design and construction.** *W. Cst. Lumberm.* 68 (11), 1941 (32b–f). [Kenworth Motor Truck Corp.]

With reference to trucks built specifically for logging in western North America.

32.91.22 : 76.1. COLLINS, T. W. **Analysis of highway log truck hauling costs.** *Timberman* 43 (1), 1941–42 (34, 36, 38, 42).

33. CONVERSION AND PRESERVATION OF WOOD

33 : 94.11 (931). **State Forest Service utilisation unit.** *N.Z. J. For.* 4, 1940–41 (316–8).

An aerial photograph of the unit shows the lay-out, and brief descriptions are given of the various departments, including mill, sorting table, drying kilns, box factory, wood preservation plant, etc.

33 : 97.4 (71.4). PICHE, G. C. Les petites industries forestières dans la Province de Québec. **[Small forest industries in the Province of Quebec.]** *Timber of Canada* 2 (1), 1941 (112, 114, 116). [F.]

33.1. *Mechanical Conversion excluding the Manufacture of Mechanical Pulp*

33.15. Manufacture of Veneers and Laminated Wood. Gluing

33.15. SEBORG, R. M., and STAMM, A. J. **The compression of wood.** *Mech. Engng.* 63, 1941 (211–3). [Forest Products Laboratory, Madison, Wis.] L.S.

Conclusions drawn from compression tests on ordinary (neither laminated nor resin-impregnated) Hickory and Douglas Fir wood are as follows:—Compression increases with both moisture content of the wood, up to fibre saturation point, and with pressing temperature. If pressures considerably above the fibre stress at proportional limit are applied, differences in moisture content and pressing temperature have but a small effect upon the degree of compression. When compressed at high temperatures, under high pressures and conditions that prevent appreciable losses of moisture during the pressing, wood retains virtually all of its compression unless it absorbs moisture in excess of that present at the time of pressing. In the species tested, wood containing 20 per cent. or more moisture and pressed at 325° F. retains at least 80 per cent. of its compression, even after soaking in water and redrying. When making ordinary compressed wood it is therefore advisable to start with only partially seasoned wood or to bring the wood to at least 20 per cent. moisture content and to effect compression at temperatures somewhat above 325° F., in order to retain the maximum amount of compression under all kinds of exposure conditions.

33.15. **Synthetic adhesives for plywood manufacture: Aerolite—an urea foam adhesive.** *British Plastics & Moulded Products Trader* 13, 1941 (186). L.S.

Wrinkling and other troubles due to wetting and glue penetration have been obstacles to the use of urea-formaldehyde glues for making very thin plywood. To obviate such difficulties a foamed, modified urea-formaldehyde glue known as Aerolite F.67 has been developed by a British firm. By using this glue as a foam an extremely thin, uniform spread can be obtained; under ordinary factory conditions it is possible to secure a spread of 1·35 lb. of glue per 100 sq. ft. The foam on the veneers will be dry by the time that they have been assembled for pressing, which is done at a temperature of 90° C., thus enabling the use of hot-water heating and avoiding troubles due to over-heating of the wood.

33.15. HORN, H. (to Norddeutsche Seekabelwerke Akt.-Ges.) **Adhesive for veneer, etc.** *German Patent No.* 698,818, Oct. 17, 1940 (Cl. 38*c*. 1.01.) Chem. Abs. 35 (6697). P.R.

Polystyrene foils made pliable by stretching are used as adhesives for veneers, etc.

33.15. ENDE, E. FREIHERR VON, and GEFFCKEN, H. **Uniting pliable glue-surfaced sheets of wood.** *U.S. Patent* No. 2,245,169, June 10, 1941. Chem. Abs. 35 (6029). P.R.

A method of manufacturing compressed wooden materials such as plywood involves assembling a number of readily pliable glue-surfaced sheets of wood into a stack with alternate sheets having their grain extending at right angles to one another, uniting and simultaneously corrugating the sheets in the stack by applying heat and increasing pressure applied along lines extending at an angle of approximately 45° to the grain of all the sheets, and permitting the stack to cool while still under pressure, whereby it will set in the form of a solid compact block, the corrugations increasing the resistance of the block to deformation and substantially eliminating any tendency to tear at its edges when subjected to mechanical operations.

33.15 : 12.26–8 : 31.27 (73). MULLER, J. L. **American hardwood plywood.** *Tr. Promotion Ser. U.S. Dep. Comm.* No. 210, 1940. pp. 65.

The information presented in this bulletin is indicated by the main headings:—American and foreign hardwoods used; manufacture of hardwood plywood; uses of hardwood plywood; where and how to buy plywood; export trade; organization of the industry; engineering data.

33.15 : 12.26–8 : 33.14. AUSTRALIA. **Council for Scientific and Industrial Research. Division of Forest Products. Annual report for 1940–41.** [Melbourne. 1941 ?.] pp. 10.

Mountain Ash (*Eucalyptus regnans*) can be

peeled into a good tight veneer $\frac{1}{12}$ in. thick and should be suitable for match splints (p. 7).

Tests with $\frac{1}{2}$-in. Queensland Maple (*Flindersia* spp.) 3-ply bonded with Tego film have shown that the temperatures used in Tego bonding do not weaken the timber (p. 7).

33.15 : 33.12. STEVENS, W. C., and TURNER, N. **Bending wood.** *Wood* 6, 1941 (325–7). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

A description is given of a method of bending wood by which laminated circular rings or hoops of almost any dimension can be successfully made.

33.15. STEVENS, W. C., and TURNER, N. **Investigations into the movements of laminated bends.** *Wood* 7, 1942 (11–4).

Tests on the change of shape that occurs between the time when the glued laminated wood is bent and when it is 'set' ready for assembly.

33.15 : 33.36.1 : 31.27. OLIVER, W. A. **Tests of glued laminated wood beams impregnated with creosote.** *American Society for Testing Materials, 1941 Preprint* No. 99, [1941?] pp. 14. [University of Illinois, Urbana.] P.R.

Results obtained in these tests indicate that, given a proper period of seasoning, the same strengths may be expected from glued and creosote-treated beams as are expected from plain solid beams or glued untreated ones.

33.15 : 33.8. **Improved wood and its use in variable pitch wooden airscrews.** *Mon. News Lett. Div. For. Prod. Aust.* No. 118, 1941 (1–2).

"Improved" wood is made from thin veneer impregnated or coated with a synthetic resin, usually a phenol or cresol formaldehyde resin of a bakelite type, and is bonded under considerable pressure and high temperature. A variable-pitch wooden airscrew having a high-density improved-wood root and a light wooden blade is being manufactured in Europe and America, and experimentally in Australia. Two methods for obtaining the high-density improved-wood root are described. Wood has certain advantages over metal for use in airscrew blades, particularly its high damping capacity and light weight.

33.17. Sawmilling

33.17 : 07.7. WELLS, H. **Butt welding band saws.** *Sth. Lumberm.* 163 (2057), 1941 (292, 294).

33.3. *Chemical Treatment*

33.3 (213) : 31.1. RUNKEL, R. Der tropische Regenwald und die aus seiner Zusammensetzung sich ergebenden Aufgaben der Zellwandforschung. **[The tropical rain forest and the bearing of its composition upon the tasks of cell-wall research.]** *Kolonialforstl. Mitt.* 3, 1940 (34–44); *abstr.* in *Forstarchiv* 17, 1941 (209–10). [G.]

Chemical utilization of wood is a necessary condition of the economic exploitation of tropical forest regions, and the constant increase in the uses of pulp products makes it probable that this resource will be utilized at no very distant period. Research on the chemistry, physics, and morphology of the cell wall can be of great value in this connexion. A problem worthy of special attention is the possibility of cooking different woods in mixture, and some promising results are said to have been obtained in mixed cookings of Mangrove and *Musanga smithii*.

33.32. Pulp and Paper Manufacture

33.32. **Further information on the plasticizing of wood as developed at the Forest Products Laboratory.** *Wood Products* 46 (11), 1941 (19–20, 22).

Description is given of the two processes developed in plastic wood research:—(*a*) simple impregnation of the wood with urea, followed by drying and bending with the aid of heat, and (*b*) the urea-aldehyde treatment. Two deficiencies in wood treated by the first method—increased hygroscopicity and a tendency for the treated wood to return to a plastic condition when reheated to 212°—have been largely overcome in the second process by the addition of other chemicals, notably formaldehyde, to the soaking solution. Wood treated by the second process has much the same strength properties as untreated wood but is stiffer and harder than normal wood. This work is still in the experimental stage.

33.32. ELMENDORF, A., and LIEFF, M. **Wood plastics and synthetic hardboard.** *Sth. Lumberm.* 163 (2057), 1941 (183–8). [Elmendorf Corp., Chicago, Ill.]

An account is given of the processes developed for the manufacture of synthetic hardboards and wood plastics, of the basic reactions involved in these processes, and of the uses to

which the products can be put. There is a bibliography of 44 references.

33.32 : 31.42.11. FRIEDRICH, K. Das Verhalten von Faserplatten gegen holzzerstörende Pilze. **[The behaviour of fibre boards towards wood-destroying fungi.]** *Holz*, 4, 1941 (241–8). [G.] P.R.

Laboratory tests are described on the resistance to fungal attack of different commercial fibre (chiefly wood-fibre) boards, including some containing preservatives (different concentrations of arsenic compounds, barium compounds, 'Xylamon', or dinitro-*o*-cresol). The fungi included *Merulius domesticus*, *Coniophora cerebella*, *Polyporus vaporarius*, *Lenzites abietina*, and *L. trabea*. The tests have shown that under conditions greatly favouring rot, fibre boards can be destroyed by fungal attack; however, such conditions rarely prevail in practice. The use of preservatives is advisable in some cases.

33.32 : 34.6. Holzkunstplatten. **[Artificial wood boards.]** *Holztechnik* 21, 1941 (15–6). [G.] *Extr.* from 'Handbuch für Holzabfallwirtschaft', by L. Vorreiter; Neudamm, 1940.

A condensed description of processes for making moulded artificial boards from wood waste plus various binding agents.

33.32 (75) : 09.4. MOUZON, O. T. **The Southern pulp and paper industry . . . its past, its significance, its future.** *Sth. Pulp Paper J.* 4 (5), 1941 (19–34, 72). [University of North Carolina.]

33.32 (75) : 09.4 : 97.4. DEMMON, E. L. **The Southern forests and the pulp and paper industry.** *Sth. Pulp Paper J.* 4 (5), 1941 (40–6, 72). [Southern Forest Exp. Sta.]

A discussion of the present position of the pulp and paper industry of the southern United States with reference to production, wood requirements, forest resources and management.

33.32 : 33.02 : 12.25 : 31.1. PILLOW, M. Y., CHIDESTER, G. H., and BRAY, M. W. **Effect of wood structure on properties of sulphate and sulphite pulps from Loblolly Pine.** *Sth. Pulp Paper J.* 4 (7), 1941 (6–12). [Forest Products Laboratory, Madison, Wis.]

Results from this investigation showed that high lignin content of compression wood reduces yield and bleachability, and that minute checks in the secondary cell wall adversely affect tearing and bursting strength. Yields of pulp from mild forms of compression wood may not be adversely affected if the proportion of summerwood to springwood is low. Pulps made from wood resembling compression wood in having fibrils oriented at large angles but lacking in the minute checking were found to be inferior in important strength properties to pulp made from wood with fibrils oriented at small angles.

The proportion of summerwood to springwood appears to have little effect on the bursting and tearing strength of sulphite pulps from wood in which the fibrils of the summerwood fibres are oriented at large angles to the major axis. The fact that large angles of fibril orientation in the springwood accompanies this condition in summerwood may have contributed to the generally lower values of these properties to an extent that the usual effects of springwood and summerwood were not as evident.

After processing in a pebble mill, fibres in which the fibrils are oriented at small angles show greater fibrillation and hydration than those in which the fibrils are oriented at large angles. Compression wood fibres tend to break into fragments along the planes of the checks in the cell wall and fragmentation occurs with little or no fibrillation. Excessive bleach requirements were observed for pulps made from forms of wood with the fibrils oriented at large angles whether from non-compression wood or compression wood. *From authors' summary.*

33.32 : 33.02 : 31.1. MÜHLSTEPH, W. **Significance of fibre shapes for properties of pulp. IV. Anatomical consideration of pulp woods and fibres.** *Wochbl. Papierfabr.* 72, 1941 (201–4, 219–24). Chem. Abs. 35 (6786) P.R.

Measurements of length and width of cells do not suffice to define their form; thickness of cell walls and width of lumen are also important. Two extreme types, with many intermediate forms, exist:—bandlike fibres with very thin walls as in the Umbrella Tree, and cylindrical fibres with very heavy walls as in Beech. The form of wood cells influences their plasticity, and the density, porosity, sorption and surface properties of pulp sheets. Fibre form is important in making mixed cooks with tropical woods.

33.32 : 33.02 : 12.26–8. BRAY, M. W., and MARTIN, J. S. **Pulping Sweet Gum by**

alkaline processes. I. Effect of cooking variables on yield and pulp quality. *Tech. Assoc. Papers* 24, 1941 (251–63). Chem. Abs. 35 (6783) P.R.

33.32 : 33.02 : 12.26–8. BRAY, M. W., and CHIDESTER, G. H. **Hardwoods offer new pulping possibilities.** *Paper Mill* 63 (46), 1940 (14, 16, 18, 20). [Forest Products Laboratory, Madison, Wis.] L.S.

A conference paper in which the present use and future possibilities of hardwoods for pulping are reviewed in a general manner, with brief reference to some of the results of research carried out at the U.S. Forest Products Laboratory. The widest potential field of utilization for hardwood pulps is offered by the newsprint and cardboard industries, for which pulping by the neutral sulphite semi-chemical process appears to be the most promising method [cf. *For. Abs.* 2 (226), 3 (60)]. This process has been used industrially since 1926 for manufacturing corrugating papers from spent Chestnut tanning chips. The Forest Products Laboratory has made excellent newsprint from combinations of 15–40 per cent. semi-chemical hardwood pulp with mechanical softwood pulp, and further experiments have indicated the possibility of increasing the proportion of hardwood pulp up to 55 per cent. It is not yet known, however, whether the production of this type of newsprint is possible on a commercial scale. Recent work with semi-chemical pulps has shown that some can be bleached satisfactorily and increase markedly in strength during the bleaching process. Such pulps are likely to be suitable for greaseproof and bond papers, and a 100-per-cent. hardwood bond sheet, with properties equal to a 'No. 1 grade' commercial sulphite bond paper, has been made from a furnish consisting of 54 per cent. bleached Red Gum neutral sulphite semi-chemical pulp and 46 per cent. bleached Black Gum acid sulphite pulp with scarcely any processing. Semi-chemical pulps are also suitable for further purification by the Cross and Bevan treatment, and there may be scope for commercial development in this field.

33.32 : 33.02 : 12.26–8 : 31.3. RICHTER, G. A. **Cellulose from hardwoods.** *Industr. Engng. Chem.* (*Industr. Ed.*) 33, 1941 (75–83). [Brown Co., Berlin, N.H.] L.S.

General consideration is given to probable pulping properties of some common hardwoods of the north-eastern United States, viz. White and Yellow Birch, White and Rock Maple, and Beech. The woods of these species have higher pentosan and lower lignin contents, are denser, and contain more cellulose per cord of stacked wood than Spruce and Fir. In the unseasoned state the hardwoods, particularly White Birch, are rich in extractables that may prove to be economically recoverable. Results are presented from analyses of bark and wood, with special reference to preliminary work on the extractable substances and possible means of recovering them.

33.32 : 33.02 : 12.26–8. RICHTER, G. A. **Cellulose from hardwoods: Acid pulping studies.** *Industr. Engng. Chem.* (*Industr. Ed.*) 33, 1941 (532–8). [Eastman Kodak Co., Rochester, N.Y.] L.S.

The results are presented of acid sulphite cooks of White Birch, Yellow Birch, Rock Maple, and Beech. As compared with Spruce and Fir, these species gave somewhat lower pulp yields and higher pentosan contents, and the paper made from them had lower bursting strength and tear resistance. White Birch had a considerably higher content of ether-soluble matter than the remaining species but this was considerably reduced by seasoning the wood. Improved pulping conditions for the hardwoods depend largely upon checking hydrolysis of the cellulose and pentosans, and superior results were obtained by modifying the cooking process and reducing chip size to secure early penetration of the liquor. Ca-base liquors were much less suitable than Na-base liquors for the pulping of these hardwoods. Pulp made from sapwood gave a consistently higher tear resistance and bleached more readily than that from heartwood. In descending order of ease of pulping the species rank as follows:—Spruce and Fir, the Birches, Maple and Beech. [Cf. preceding abstract.]

33.36. Preservation of Wood. Seasoning and Drying

33.36. DAVEY, H. T. **Wood finishing; staining and polishing, and cellulose wood finishes; a treatise devoted mainly to transparent finishes for wood, with details of the fundamental principles and the allied processes.** I. Pitman & Sons, Ltd., London. pp. 224. Chem. Abs. 35 (6132–3) P.R.

33.36. RENFREW, A. (to Imperial Chemical Industries Ltd.) **Finishing wood surfaces.**

British Patent No. 515,896, Dec. 18, 1939. Chem. Abs. 35 (6086) P.R.

A process for finishing wood surfaces comprises applying an aqueous emulsion of a thermoplastic synthetic resin containing a polymer or interpolymer of a substance comprising the group $CH_2 = C <$, depositing the resin on the surface by removing the water, pressing the resin deposit at a temperature above the melting point of the resin and finally cooling down while maintaining pressure.

33.36 : 38.2. **Prevention and control of decay in dwellings.** *Tech. Note For. Prod. Lab., Wis.* No. 251, 1941. pp. 4.

33.36.1. *Preservation against Attack by Plants and Animals*

33.36.1. NARAYANAMURTI, D. **A short note on wood preservation for users in India.** *Pamphl. (Wood Pres. Ser.) For. Res. Inst. India* No. 1, 1940. pp. 14. [Forest Research Institute, Dehra Dun.]

A brief review of the data on types of wood preservatives, preparation of material for treatment, treating processes, and cost of treatment.

33.36.1. **Report of the Special Committee on the painting of creosoted wood.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (81–6).

Service records of a number of paints in use on creosoted wood are summarized according to paint characteristics. A larger percentage of paint-coat failures is noted for applications on creosoted wet surfaces than for those on moist and dry surfaces. Results suggest that more aluminium pigment than the customary 2 lb. per gal. of vehicle may be justified in this work.

33.36.1 : 31.43. WALKER, F. S. **Resistance of timbers to marine borer attack.** *Malay. For.* 10, 1941 (145–9).

An account is given of tests at Port Swettenham on 44 timber species, treated and untreated, for resistance to marine-borer attack. In the untreated condition only 7 species had any appreciable natural resistance: of these Billian (*Eusideroxylon zwageri*) gave the best results, but was closely followed by Greenheart (*Nectandra rodioei*), Keledang (*Artocarpus lanceaefolia*), Kemalau (*Parinarium oblongifolium*), and Merbau (*Intsia palembanica*), while Kulim (*Scorodocarpus borneensis*) and Tempinis (*Sloetia elongata*) lasted almost as well. Billian and Greenheart are widely known for resistance to marine borers; the remaining 5 species are Malayan, but only Merbau is available in large quantities. The specimens used were too small for reliable estimation of the service life of larger sizes, but indications are that 12-in. square piles of the timbers named might have a service life of 7–10 years. However, local timbers usually regarded as durable and used for heavy construction in Malaya can be employed successfully for marine piles if the part exposed to borer attack is protected by metal sheathing, and piling so protected is reputed to have lasted over 25 years at Port Swettenham. For the treated timbers three unnamed proprietary preservatives and 50:50 creosote/Diesel oil were used. No evaluation of the results is attempted, largely on account of the difficulty of resolving the effects of variables such as natural resistance, toxicity of preservative, absorption and penetration. The creosote/Diesel-oil mixture, however, did not give the immunity that might have been expected from reports of experience in other parts of the world.

33.36.1 : 31.43. AGDEPPA, F. T. **The effect of some insecticides on varnished and finished surfaces.** *Philipp. J. For.* 4, 1941 (161–9). [Bureau of Forestry, Philippines.]

Results of tests on the application of six different insecticides to wood surfaces coated with Servispar, Sandarac, or shellac.

33.36.1 : 31.43 : 13.2. **Pin-hole and shot-hole borers.** *Aust. Timb. J.* 7, 1941–42 (353, 388).

A brief note on the life history and control of these borers (ambrosia beetles). Control consists in rapid removal of logs from the forest, especially in spring and summer, usually barking them and spraying the ends with creosote. Sawn timber should be dried as quickly as possible. Steam treatment and boiling in water will kill the borers but time schedules are not definitely known.

33.36.1 : 31.43 : 13.2. WOLFF, M. **Principles of the preservation of wood from the Longhorn beetle.** *Bauverwaltung* 61 (20), 1941 (368–72). Building Sci. Abs. (*n.s.*) 14 (713) P.R.

33.36.1 : 31.43 : 13.2 : 33.31. **The commercial development of the C.S.I.R. process for the preservation of veneer against the attacks of the powder post borer (*Lyctus brunneus* Stephens).** *J. Coun. sci. industr. Res. Aust.* 14, 1941 (222–3) P.R.

The boric-acid treatment developed by the Council for Industrial and Scientific Research

for the preservation of veneer against *Lyctus* attack [cf. *For. Abs.* 1 (99); 3 (61, 145)] has now been in commercial use for about two years, during which no complaint has been received of borer attack in treated wood. At present, 8 plywood mills in Queensland and 4 in New South Wales are employing this process. Further laboratory experiments have shown that if the concentration of the preservative solution and the period of treatment are increased, 2-in. boards can also be rendered immune to *Lyctus*, and tests are now in progress on a semi-commercial scale to obtain data on the design of vats and the economics of the process.

33.36.1 : 31.45 : 13.2 : 33.31. KYRIDES, L. P. (to Monsanto Chemical Co.) **Repellents for ambrosia beetles.** *U.S. Patent* No. 2,244,712, June 10, 1941. Chem. Abs. 35 (6054) P.R.

Materials such as green logs and green lumber are treated with an *N*-alkylated alkylene polyamine selected from the group consisting of *N*-alkylated ethylenediamines, propylenediamines, trimethylenediamines, diethylenetriamines, dipropylenetriamines, triethylenetetramines, and tripropylenetetramines in which at least one of the alkyl groups contains more than 7 and less than 21 C atoms.

33.36.1 : 31.43 : 13.2. HUNT, G. M., and SNYDER, T. E. **An international termite exposure test—twelfth progress report.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (379–91). [Forest Products Laboratory, Madison, Wis.]

Tabulated records are given of the results thus far obtained from wood specimens, mainly of the sapwood of Southern Yellow Pine and Ponderosa Pine, that have been treated with various chemicals and exposed to termites and decay.

33.36.1 : 33.12. **Report of Committee 7–11—uses of treated wood for car lumber.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (154–9).

Report of supplementary information on parts of railroad cars for which treated lumber has been used and of service records of treated and untreated car lumber.

33.36.1 : 33.31 (73) : 09.4. HELPHENSTINE, R. K. **Quantity of wood treated and preservatives used in the United States in 1940.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (410–43).

33.36.1 : 33.31. **Report of Committee 4—preservatives.** [With discussion.] *Proc. Amer. Wood Pres. Ass.* 37, 1941 (32–44).

Recommendations are made for the revision of certain specifications in the A.W.P.A. Manual relating to preservatives, and a revision of Standard Specifications for creosote coal-tar solutions (5e) is presented and adopted as a tentative standard. A report is included on formulations, use in treating plants, and use in service, of preservatives in actual commercial use other than those covered by present standards. These include chromated zinc chloride, Wolman salts, and zinc-meta-arsenite.

33.36.1 : 33.31. VOORHIES, G. **Oil-tar creosote for wood preservation.** *Bull. Ore. Engng. Exp. Sta.* No. 13, 1940. pp. 78.

It is concluded that:—(*a*) oil-tar creosote possesses all of the requirements of the American Wood Preservers' Association specifications for grade 1 creosote with the exception of the guarantee of coal-tar origin, and a specific gravity difference of 0·01, (*b*) oil-tar creosote is almost as toxic as the standard grade 1 coal-tar creosote tested, (*c*) it has a greater resistance to volatilization than coal-tar creosote, (*d*) it has good penetrating qualities, and (*e*) it has a low viscosity.

33.36.1 : 33.31. BAECHLER, R. H. **Resistance to leaching and decay protection of various precipitates formed in wood by double diffusion.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (23–31). [Forest Products Laboratory, Madison, Wis.]

It is concluded that:—(i) Compounds of low solubility may be deposited in green wood by successively steeping it in solutions of different salts. (ii) The chromates and arsenates of copper and nickel and magnesium ammonium arsenate, when formed in wood by this method, are leached more slowly than are soluble salts. (iii) The leached blocks show considerable resistance to attack by three wood-destroying fungi and some resistance to a fourth. *Author's summary.*

33.36.1 : 33.31. HÄGER, B. **Preservation of wood with the Boliden preservative composed of difficultly soluble arsenates.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (45–53). [Bolidens Gruvaktiebolag, Stockholm.]

The preservative solution described was developed in Sweden. Arsenic acid is the active agent against decay and insects and is used both in pure form and in sodium arsenate. To prevent leaching, these chemicals are fixed in the wood as insoluble compounds through the action of sodium bichromate and zinc

sulphate. Impregnation may be by either an open-tank method or a full-cell pressure treatment. Swedish Pine (*Pinus sylvestris*) absorbs 16 lb. of the solution (1–1·2 per cent. arsenic acid) per cu. ft. of wood by the first method and about 20 lb. of solution (0·9 per cent. arsenic acid) per cu. ft. by the second method. Good distribution of preservative is obtained. The wood must be dried after treatment, when it becomes a pale green colour. Treated wood is odourless, can be handled with safety, can be painted or otherwise finished, does not suffer a reduction in mechanical strength, and becomes somewhat resistant to ignition. Laboratory tests have shown that the preservative is resistant to leaching and is effective against fungal attack, and field tests have supported these findings. Wood treated with the Boliden salt has proved to be resistant to termites and marine borers. Further tests are in progress. The preservative is patented. [Cf. *For. Abs.* 2 (60).]

33.36.1 : 33.31. ANDREWS, L. K., GOTTSCHALK, F. W., and JOHNSON, J. P. **Service records for Wolmanized lumber.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (54–80). [American Lumber & Treating Co.]

Examples of service records of Wolmanized lumber from 1925 to 1940 are tabulated. Records are based on the inspection of more than 21 million bd. ft. of such material in commercial service under various types of exposure. It is shown that 61·8 per cent. of the installations had 10 to 15 years' service, that only 0·2 per cent. of the lumber was removed because of decay and 1·2 per cent. because of mechanical defects. There were no termite infestations in the installations examined.

33.36.1 : 33.31. LINDGREN, R. M. **Chlorinated phenols on the wood-protection front.** *Sth. Lumberm.* 163 (2057), 1941 (219–22).

An account is given of the properties, uses in the preservative treatment of wood, and methods of application of water- and oil-soluble chlorinated phenols, with particular reference to pentachlorphenol.

33.36.1 : 33.31. BERRY, A. G. U., and CATER, J. C. **Preliminary report on trials of copper naphthenates and mercuric naphthenates as wood preservatives.** *Emp. For. J.* 20, 1941 (179–80). [Trinidad Leaseholds Ltd.]

The composition and properties of metallic naphthenates are discussed with particular reference to their solubility in oil and insolubility in water, and their waterproofing action. Woods that are naturally susceptible to decay and termite attack, including *Cordia lockhartii* and *Pinus strobus*, were treated with concentrations of copper naphthenates and mercuric naphthenates of 20 to 2·5 per cent. and 3·5 to 0·44 per cent., respectively, and have withstood the severe conditions of a tropical timber graveyard for periods up to twenty months without deterioration. During a shorter period untreated test pieces of the same woods have been completely destroyed. *From authors' summary.*

33.36.1 : 33.31 : 33.53. **New method copper treatment for wood.** *Timberman* 43 (2), 1941–42 (34).

A copper sulphate treatment for wood, particularly piling, which is claimed to be rendered immune to teredo attack, has been developed by H. S. Andrews and is being applied commercially by the Olympia Wood Preserving Co. The process is an electrochemical treatment by immersion in an electrified copper sulphate solution, which penetrates the wood to a depth of 3 in. A reagent is used that tends to harden the wood and to increase its tensile strength by as much as 30 per cent. after immersion in salt water. The company estimates that the life of piles treated by this method would be extended to 40 years or more, and that dry rot would be entirely eliminated in bridge and other heavy construction timbers.

33.36.1 : 33.4 : 33.5 : 12.25. **Report of Joint Committee on Douglas Fir, pressure processes.** [With discussion.] *Proc. Amer. Wood Pres. Ass.* 37, 1941 (96–9).

Recommendations are made and approved to modify the tentative (1940) A.W.P.A. Specifications Standards 38b, 41b, and 51a for the preservative treatment of Pacific Coast Douglas Fir ties and lumber, piles, and poles, respectively, by pressure processes.

33.36.1 : 33.4 : 33.52 : 12.26–8. **Report of Committee 5-1—Oak ties and lumber, pressure treatment.** [With discussion.] *Proc. Amer. Wood Pres. Ass.* 37, 1941 (87–95).

Results are given from investigations on the penetration of preservative in Red Oak, which were made in connexion with the preparation of a specification for the pressure treatment of Oak ties and lumber.

33.36.1 : 33.4 : 38.2. KORSMO, A. M. **Treated lumber and the United States Housing Authority program.** [With discussion.] *Proc. Amer. Wood Pres. Ass.* 37, 1941 (212–21). [U.S. Housing Authority, Washington, D.C.]

33.36.1 : 33.4 : 38.3. HAGGANDER, G. A. **Revising Burlington bridge standards to reduce preframing of creosoted timber.** [With discussion.] *Proc. Amer. Wood Pres. Ass.* 37, 1941 (203–11).

In this work treated timber was considered as an entirely different material from untreated timber for construction purposes and special designs were made for the requirements of treated timber. These are discussed in detail.

33.36.1 : 33.4 : 38.3. BROACH, J. B. **North Carolina's experience with the use of treated timber in highway construction.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (222–8). [N. Carolina State Highway & Public Works Commission.]

33.36.1 : 33.4 : 38.3. **Report of Committee 7–2—bridge and structural timber.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (322–6).

The revision of specification 48a Standard Instructions for Field Treatment of Creosoted Timber and Piling recommended in 1940 was adopted. Service records are given for four timber bridges treated with grade 1 creosote, constructed in 1934, 1930, 1926, and 1937 respectively.

33.36.1 : 33.4 : 38.3 : 13.2 : 38.54 : 07.7 : 38.8. **Report of Committee 7–10—diversified uses of treated wood.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (230–8).

In a proposed and approved revision of the A.W.P.A. Standard 50a it is recommended that for protection against decay and subterranean termites building members in contact with the ground (as listed) should be pressure-treated with coal-tar creosote giving a net retention of 8 lb. per cu. ft., members not in contact with the ground (as listed) should be so treated with coal-tar creosote or an approved toxic salt, and nailing strips should be treated with either creosote or salt giving a net retention of 6 lb. per cu. ft. Cut surfaces should be coated with preservative and before installation lumber should be seasoned to the moisture content approximating conditions in use.

New developments in the use of miscellaneous treated-wood products reported on include creosote-timber-lined pits for fuel-oil storage tanks, an effective method for driving creosoted fence posts, and pressure-creosote-treated lumber as ditch checks for controlling erosion in road ditches.

33.36.1 : 33.51. TRANSVAAL. **Transvaal Chamber of Mines Timber Research Laboratory annual report 1940.** Johannesburg. 1941. pp. 22.

Mining timbers treated with 'Yard' mixture [cf. *For. Abs.* 3 (146)] and subjected to severe conditions of a temperature range of 82°–86° F. and almost saturated air showed signs of slight decay after seven years, whereas untreated timbers were completely decayed within eighteen months under similar conditions (p. 4).

33.36.1 : 33.52. WILLIAMS, A. N. **Thirty-one years' experience with treated ties on the Lehigh Valley.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (188–95).

33.36.1 : 33.52 : 33.53 : 33.4 : 33.12. ADAMS, L. L. **Use of treated timber and ties by the Louisville & Nashville railroad.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (197–202).

33.36.1 : 33.52. **Report of Committee 7–1—tie service records.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (302–21).

Records are tabulated of the service life and renewals for a number of test tracks of sleepers in the United States, representing a variety of species, preservative treatments and service periods.

33.36.1 : 33.52 : 12.26–8 : 33.31 : 31.42.11. SCHMITZ, H., BUCKMAN, S. J., and SCHRENK, H. VON. **Studies of the biological environment in treated wood in relation to service life. I. Changes in the character and amount of 60/40 creosote-coal tar solution and coal tar and the decay resistance of the wood of Red Oak crossties after three years of service.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (248–97). [Minnesota Agricultural Exp. Sta., St. Paul.]

33.36.1 : 33.53 : 12.25. **Report of Committee 5–4—Southern Pine piles, pressure treatment.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (100–1).

33.36.1 : 33.53 : 12.25. **Report of Committee 5–5–1—poles pressure treatment.** [With discussion.] *Proc. Amer. Wood Pres. Ass.* 37, 1941 (117–34).

Details are given of tentative standard specifications for the preservative treatment of Jack Pine, Red Pine and Lodgepole Pine poles by pressure processes. The preservative to be

used in each case shall conform to the A.W.P.A. Standard Specification for Creosote, the retention of preservative to be not less than 8 lb. per cu. ft. for Jack Pine and Lodgepole Pine and from 8 to 12 lb. per cu. ft. for Red Pine, depending on use requirements.

33.36.1 : 33.53 : 12.25 : 33.36.3. SEGELKEN, J. G. **Kiln drying Longleaf Southern Pine poles.** [With discussion and comments.] *Proc. Amer. Wood Pres. Ass.* 37, 1941 (135–54). [Bell Telephone Laboratories, New York.]

Results are summarized from experiments undertaken to determine steam consumption, rate of drying and general behaviour of Longleaf Pine (*Pinus palustris*) poles during kiln drying, and also the creosote penetration and retention of the kiln-dried poles given an 8-lb. empty-cell treatment. It appears that pole size may influence steam consumption and water loss, the smaller poles giving more satisfactory results. After preservative treatment about 94·5 per cent. of the samples examined showed 100-per-cent. penetration of the sapwood, and the creosote retention varied from 7·1 to 9·9 lb. per cu. ft.

33.36.1 : 33.53 : 12.25. **Report of Committee 7–7—pole service records.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (172–85).

Details are given on location, species, preservative treatment and service records for a number of pole installations in various places in the U.S.A., for which data were received during 1940.

33.36.1 : 33.53 : 12.26.8. AUSTRALIA. **Council for Scientific and Industrial Research. Division of Forest Products. Annual report for 1940–41.** [Melbourne. 1941?]. pp. 10.

Of the preservative treatments tested for Messmate (*Eucalyptus obliqua*) poles, the open-tank and pressure treatments with coal-tar creosote were highly effective, while superficial treatments, e.g. brushing with creosote over sapwood, charring, arsenic collars, arsenic and sodium fluoride collars, are all breaking down. The best of these treatments was oxyacetylene charring plus spraying with creosote.

Analysis of water-leached creosote oils shows the chief effects of leaching to be loss of tar acids, loss of the more volatile portion of the oil, and a large drop in toxicity (p. 6).

33.36.1 : 33.53 : 33.31. MACLEAN, J. D. **Information obtained from marine piling experiments on the Gulf coast.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (101–17). [Forest Products Laboratory, Madison, Wis.]

Results from experiments in the preservative treatment of piling showed that:—(i) when the preservative had properties that offered distinct resistance to borer attack, their effectiveness became more pronounced as the absorption was increased; (ii) oils with high proportions of light distillates or tar acids are very definitely less effective than oils with higher boiling constituents; (iii) in creosote mixtures containing high percentages of naphthalene the resistance to borer attack decreased with increase in proportion of naphthalene; (iv) no particular benefit appeared to be gained by fortifying creosote with chemicals such as copper salts, organic or inorganic arsenic compounds, carbazole, dinitronaphthalene, dinitrochlorobenzene, and ferric chloride; (v) the addition of paraffin or Montan wax decreased the resistance of coal-tar creosote to borer attack; (vi) none of the soluble or insoluble preservative salts tested gave more than slight resistance to borer attack; (vii) the iron rust from steel nails driven into the wood offered considerable resistance to borer attack while copper nails were much less effective; (viii) *Limnoria* and *Martesia* can enter heavily treated wood that is effectively protected against shipworm, and they hasten the loss of preservative from the wood and so help prepare the way for shipworm attack. *From author's summary.*

33.36.1 : 33.53. **Report of Committee 7–4–1—marine piling service records.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (327–38).

Service records are given for piling of creosoted Douglas Fir in structures on San Francisco Bay, and of creosoted Southern Yellow Pine piling in Connecticut. A test experiment has been started with dry selected green piling of Loblolly Pine treated by the Rueping process with high-grade creosote at 22 lb. per cu. ft.

33.36.1 : 33.54. **Report of Committee 5–6–1—posts, pressure treatment.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (300–1).

It is recommended that the Standard Specification (37) for the pressure treatment of round Pine posts should be retained with certain modifications.

33.36.1 : 33.54. **Report of Committee 7–9—post service records.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (338–53).

Service records are tabulated for posts, the

location, species, form and size, preservative treatment and condition being indicated.

33.36.1 : 33.54 : 33.31. WIRKA, R. M. **Comparison of preservatives in Mississippi fence post study.** [With discussion.] *Proc. Amer. Wood Pres. Ass.* 37, 1941 (365–79). [Forest Products Laboratory, Madison, Wis.]

A test was started in 1936–37 to determine the relative effectiveness and economy of 23 wood preservatives applied to fence posts of Southern Pine. The results to date for each preservative are given in detail. No decay or termite damage was observed in posts treated with eight of the preservatives but the test has not gone far enough to permit conclusions except for two of the preservatives—crankcase oil and 10–90 creosote/used crankcase oil solution—which, in the amounts used, appear to be wholly inadequate under the conditions of the test.

33.36.1 : 98 : 33.1 : 33.31 : 33.36.3 : 52.43.2. **Report of Committee 5–9—inspection.** [With discussion.] *Proc. Amer. Wood Pres. Ass.* 37, 1941 (160–71).

Recommendations are made for the revision of A.W.P.A. Standard 2c, Standards for the Purchase and Preservation of Treatable Timber, and for the elimination of Standard 12a, Standard Definitions of Processes, from the Manual of the Association.

33.36.2. *Fireproofing*

33.36.2. **Report of Committee 9—fireproofing.** *Proc. Amer. Wood Pres. Ass.* 37, 1941 (392–401).

Consideration is given to reports of a number of projects on the fire-testing and fireproofing of wood.

33.36.2 : 33.31. HARKOM, J. F. **Fire retardant paints.** Forest Products Laboratories of Canada, Ottawa. 1940. pp. 2 + figs.

Description of a method devised for testing the fire-retardant properties of paints.

33.36.2 : 33.31. ENGELHARDT, R., and HEUCK, C. (to Jasco Inc.) **Wax-like composition suitable for insulation and for fireproofing wood or textiles.** *U.S. Patent* No. 2,248,749, July 8, 1941. Chem. Abs. 35 (6697) P.R.

Use is made of a preponderant amount of wax-like chlorinated naphthalenes and a smaller amount of polymerized isobutylene.

33.36.2 : 33.31. STRAUSZ, H. J. **Timber flame-proof, fire-retarding coating composition.** *British Patent* No. 540,642, Mar. 23, 1940 & Oct. 24, 1941. Cotton Res. Summ. 21 (628–9) P.R.

The composition consists, apart from water, of a preponderating proportion of precipitated calcium sulphate, with colloidal silica, colloidal alumina and boric acid, which react with calcium sulphate to produce a glaze under the action of heat. Diammonium phosphate and other proved flame-proof salts and a suitable inorganic or organic binder may be added. The glaze-producing substance may advantageously be a mixture of bentonite with boric acid. A fireproofing composition of this type may be used for exterior coatings when a washable paste distemper is added as a binder and thoroughly mixed with it.

33.36.2 : 33.31 : 33.36.1 AKHMADULLIN, I. G. **The antiseptic properties of some fireproofing agents for wood.** *Mitt. Kirov. forsttech. Akad.* No. 59, 1940 (41–7). Chem. Abs. 35 (6759) P.R.

The antiseptic properties of various NH_4 salts and of their mixtures were tested against *Coniophora cerebella*. NH_4Cl possesses the maximum and $(NH_4)_2\ SO_4$ the minimum antiseptic properties. Addition of borax or NaF to NH_4 salts increases their antiseptic properties. $ZnCl_2$ alone has but slight antiseptic power, but it increases that of NH_4 salts. For fireproofing it is recommended to saturate the wood with a mixture of 12 per cent. NH_4Cl and 8 per cent. $ZnCl_2$.

33.36.3. *Seasoning. Drying*

33.36.3. **The treatment of timber in a drying kiln.** *Leafl. For. Prod. Res. Lab.* No. 20, 1941. pp. 8.

An outline of the general principles involved. A table is included showing the approximate relation between wet bulb hygrometer readings and equilibrium moisture contents of wood at various air temperatures in a drying kiln.

33.36.3. SAUTER, E. (to Siemens-Schuckertwerke Akt.-Ges.) **Drying, particularly lumber and cellulose, by means of a high-frequency field with short or ultra-short waves.** *German Patent* No. 698,964, Oct. 24, 1940 (Cl. 82*a*. 1.01). Chem. Abs. 35 (6793) P.R.

33.36.3. MITTLEMAN, E., and STEPHEN, J. L. **Drying of wood by high frequency current.** *Wood Products* 46 (10), 1941 (16–7). [Northwestern University.]

A report of a small-scale experiment which indicates that wood can be dried quickly and effectively by high-frequency current at reasonable cost. Green wood with a moisture content of 48 per cent. dry weight was heated by a high-frequency generator of 12-meter wavelength and the power absorption was maintained at 115 watts high-frequency power per 12 cu. in. of wood. The moisture content dropped to 15 per cent. within 6 minutes. It is pointed out that water was removed by pressure set up in the interior of the wood as well as by evaporation.

33.36.3 : 07.7. Richtlinien für den Bau und die Abnahme von hochwertigen Holztrocknungsanlagen. **[Principles for the construction and servicing of efficient drying kilns.]** *Holztechnik* 21, 1941 (165–7). [G.]

General directions as drawn up by a committee of the Arbeitskreis Holztrocknung im Fachausschuss für Holzfragen, Berlin.

33.36.3 : 31.1 : 31.8 : 12.25. Stegeman, J. D. **Some things to know about Redwood.** *W. Cst. Lumberm.* 68 (12), 1941 (66–7).

Kiln-drying requirements, properties and uses for Redwood depend largely upon the percentage of summerwood present. This and the amount of abnormal compression wood are the important points to know for upper-grade Redwood.

33.36.3 : 33.31 : 33.32. Berliner, J. F. T. **Seasoning and treating Southern lumber with urea.** *Sth. Lumberm.* 163 (2057), 1941 (189–95).

A general account is given of the properties of urea and the methods of applying it in the chemical seasoning of wood, and of the results that have been obtained from tests with urea both in chemical seasoning and in the bending and forming of wood and wood products.

33.36.3 : 33.31 : 33.8. Mabesa, C., and Ruiz, Q. **The use of common house salt in seasoning Balobo, Bolon, Malaikmo, and Pili bowling pin flitches.** *Philipp. J. For.* 4, 1941 (123–40). [Bureau of Forestry, Philippines.]

33.36.3 : 33.53 : 12.25. McDonald, F. **Seasoning of Larch poles at Hanmer.** *N.Z. J. For.* 4, 1940–41 (313–5).

Under the severe seasoning (weather) conditions of the area in question, seasoning of Larch poles should be started under forest shade until the fibre saturation point is reached and then piled as close as possible in the open seasoning yard with the tops away from the prevailing wind. This results in numerous short, evenly spaced checks of moderate width and depth which are preferable to the large irregular checks following too rapid early drying. Poles should not be creosoted until their moisture content is below 20 per cent. of the oven-dry weight.

33.36.3 : 34.26. Gerdien, H., and Jubitz, W. (to Siemens-Schuckertwerke Akt.-Ges.) **By-products of lumber drying.** *German Patent* No. 698,868, Oct. 17, 1940 (Cl. 22*h*. 1.01). Chem. Abs. 35 (6762) P.R.

Green lumber is artificially seasoned in a high-frequency field with a wavelength of 5–50 m. The drying is rapid and thorough. Resins and oils vaporize along with the moisture: the vapour carrying these substances is collected, washed, and the resins and oils recovered in the usual way.

33.36.3 : 76.1. Wright, G. W. **Kiln drying practice and costs in Australia.** *Aust. Timb. J.* 7, 1940–41 (395–6, 438). [Division of Forest Products, C.S.I.R.]

The average kiln in Australia has a capacity of 5,000 to 6,000 super. ft. In general it has been found worth while to air dry hard woods such as Jarrah, Mountain Ash, and Alpine Ash for about 3 months prior to kiln drying, the preliminary air drying being sufficient to bring the moisture content of 1-in. stock down to 30 per cent. or less; the timber can then be kiln dried to a moisture content of 12 per cent. in 4 to 6 days (24 hours per day), as compared with 3 weeks for kiln drying from the green condition. Soft woods, on the other hand, are normally kiln dried from the green condition, the time required being about 4 days. For Australian hard woods (1-in. boards) the cost of kiln drying should not exceed about 4*s*. 10*d*. per 100 super. ft. (including cost of preliminary air drying). The cost of kiln drying soft woods from the green condition should not exceed about 3*s*. 10*d*. per 100 super. ft. The paper includes a discussion of common methods of handling stock for kiln drying and of the cost of kiln construction.

33.38. Charcoal Manufacture. Use of Wood and Charcoal in Producer-Gas Generators

33.38.1 : 12.26–8. Carmelich, J. N. F. Fabricación de carbón de leña de quebracho blanco

en Santiago del Estero. **[Manufacture of charcoal from *Aspidosperma quebracho* in Santiago del Estero.]** *Repr.* from *Ingeniería Agronómica* 1 (3), 1940 (5–12). [Span.]

Notes on technique and cost of production. The charcoal is manufactured by the beehive method.

33.38.1 : 33.38.2. IRVINE, C. J. **The manufacture of wood charcoal.** *Leafl. For. Comm. Vict.* No. 1, 1941. pp. 19.

33.38.1 : 33.38.2 : 12.26–8 (94). PLANTE, E. C. **An examination of some Australian hardwood charcoals with special reference to their suitability for charcoal gas producers. Part II.** *J. Coun. sci. industr. Res. Aust.* 14, 1941 (191–200). P.R.

Destructive distillation of River Red Gum (*Eucalyptus rostrata*) has been undertaken at maximum temperatures of 600°, 450°, and 350° C., respectively, and the charcoal produced examined by standard methods. Examination and analysis was made of charcoal from various Queensland timbers. The prevailing view that certain northern timbers give charcoal of high ash content has been confirmed. A method is outlined for the determination of the 'tar content' of charcoal. *From author's summary.*

33.38.2. AUBERT, F. Les carburants de remplacement au Comptoir suisse de Lausanne. **[Substitute fuels at the 'Comptoir suisse', Lausanne.]** *J. for. suisse* 92, 1941 (241–3). [F.]

Exhibits in the producer-gas section of the fair included torrefied wood (charbon roux), containing less tarry substances than ordinary wood and having a moisture content of only 8–10 per cent.; 1·7 kg. of torrefied wood replace 1 litre of petrol.

33.38.2 : 01.6. **Gas producers for motor vehicles, their design and operation. References covering the period 1930—June 1938.** *Science Library Bibliographical Series* No. 415, 1941. pp. 8.

33.38.2 : 33.06 : 07.7. SCHWEINGRUBER, W. Die Gasholzfabrikation in der Schenkung Dapples in Zürich. **[The manufacture of producer fuelwood in the Schenkung Dapples at Zürich.]** *Schweiz. Z. Forstw.* 92, 1941 (304–11). [G.]

Description of a recently installed plant consisting of saws and splitting machines, with which the (unbarked) wood is cut to size, a conveyor belt, and a set of 60-cm.-wide silos having wire-mesh walls, which are exposed to free air circulation. It takes about 3 months to dry the fuelwood to the required moisture content.

33.39. Manufacture of Sugar, Oils, Alcohol, and Vinegar from Wood

33.39. KAMAZUKA, A., and ROKUSHO, B. **On the saccharification of wood and the alcoholic fermentation of sugar. 3 & 4.** [Pt. 4 by A. Kamazuka alone.] *J. Soc. chem. Ind. Japan* 43, 1940 (230B–231B); *abstr.* in *Holz* 4, 1941 (268). [G.] P.R.

33.4. *Converted Structural Timber*

33.4 : 12.25. **Pacific Coast Hemlock as a construction material.** *B. C. Lumberm.* 25 (10), 1941 (61–2).

The properties and characters of this wood make it suitable for use, when properly dried, in light construction in all types of buildings, for siding, sub-floors, wall and roof sheathing, and concrete forms, and also for heavy flooring and planking. [Cf. *For. Abs.* 2 (291).]

33.5. *Pitprops, Sleepers, Poles and Other Roughly Converted Wood*

33.54. LIEFELD, T. A. **What is the life of steel fence posts?** *J. For.* 39, 1941 (960). [Southern Forest Exp. Sta.]

Of 36 angle-steel fence posts, $1\frac{1}{4}$ in. × $1\frac{1}{4}$ in. × $\frac{9}{64}$ in., placed in the field in 1933, five were so badly rusted at ground line by 1941 that a slight pressure would break them off. It is suggested that in many cases less expensive wooden posts would be more serviceable.

33.6. *Packing Boxes, Crates, etc.*

33.6. SACHSENBERG, E., WOLF, W., and GOTTSCHALD, R. Gesichtspunkte zur Gestaltung rohstoffsparender Kisten. **[Points of view on the design of boxes for economy in raw materials.]** *Holz* 4, 1941 (253–6). [G.] P.R.

33.6 : 12.26–8. CENTRAL PROVINCES & BERAR. **Annual report on forest utilization for the year ending 31st March, 1941.** Govt. Printing, Nagpur. 1941. pp. 21.

Tests have shown that kiln-seasoned Salai (*Boswellia serrata*), a wood previously considered useless, can be used successfully in packing-case and ammunition-box manufacture if carefully handled in assembly (pp. 2, 16).

33.6 : 31.0 : 12.25 : 12.26–8. LIMAYE, V. D. **The testing of packing cases for army boots and suggested improvements in their design.** *Indian For. Bull., Utilization* (*n.s.*) No. 92, 1941. pp. 1 + 7. [Forest Research Institute, Dehra Dun.]

Tests have shown that boxes made of Semul (*Bombax malabaricum*) have certain advantages and are practically as strong as those made of Chir (*Pinus longifolia*), the wood generally used for this purpose in the past. Small and inexpensive additions to the original design resulted in boxes 15 times stronger than the older type.

33.7. *Firewood*

33.7 : 31.24. WEBBER, L. E. **Basic facts on wood burning.** *Power, N.Y.* 85 (3), 1941 (60–2). [University of New Hampshire.] L.S.

A brief statement of the importance of moisture content of the wood fuel, its state of division, and air supply, as the chief factors governing the efficiency and speed of combustion in industrial furnaces. The desirability is emphasized of flue-gas analyses for indicating the completeness of combustion. Tables are given to show (i) the C, N, O, and ash contents and heating value of some common woods, and (ii) flue-gas analyses for complete combustion of wood; there are also graphs showing (iii) the effect of moisture content on available heating value, and (iv) the variation of the CO_2 percentage in dry products of combustion for various proportions of excess air.

33.8. *Other Manufactured Products*

33.8 : 12.25 : 12.26–8 : 31.0 (94). AUSTRALIA. **Council for Scientific and Industrial Research. Division of Forest Products. Annual report for 1940–41.** [Melbourne. 1941?.] pp. 10.

Tests of Australian timbers to determine their value in aircraft construction show that:—(i) Hoop Pine (*Araucaria cunninghamii*), although about 20 per cent. heavier than Spruce, has equal or superior mechanical properties to that species except in shock resistance, in which it is deficient. Bunya Pine (*A. bidwillii*) is about 10 per cent. deficient to Hoop Pine in density and in all mechanical properties. (ii) For their weight, Alpine Ash (*Eucalyptus gigantea*) and Mountain Ash (*E. regnans*) have exceptionally good mechanical properties, including impact strength, and it has been found that a more efficient wing span can be designed with these species than with Spruce. (iii) King William Pine (*Athrotaxis selaginoides*) shows a density of about 85 per cent. of that of Spruce and correspondingly lower strength properties but is considered to have possibilities for those parts of an aeroplane requiring a low-density timber. Leatherwood (*Eucryphia billardieri*) has been shown to have distinct possibilities as a substitute for Birch as a plywood, although it is not quite equal to the latter species in mechanical properties (p. 5).

33.8 : 31.0 : 12.26–8. **Rifle furniture.** *Mon. News Lett. Div. For. Prod. Aust.* No. 117, 1941 (4–5).

The general properties required in timber used in rifle furniture are listed. Australian timbers now being used for this purpose include *Ceratopetalum apetalum* and *Flindersia brayleyana* while *Ackama muelleri* and *Geissois benthami* are also suitable.

33.8 : 31.0 (54). LIMAYE, V. D. **Indian timbers for tool helves and handles.** *Indian For. Bull., Utilization* (*n.s.*) No. 93, 1941. pp. 8. [Forest Research Institute, Dehra Dun.]

This bulletin includes lists of the timbers classified according to the type of handle for which they are best suited, giving botanical names, trade or common names, and the Provinces in which they are available.

33.9. *Grading and Storage of Converted Timber*

33.91. HILF, H. H. Lässt sich die Holzsortierung erleichtern und verbessern? Probleme der Holzsortierung. [**Can timber grading be simplified and improved? Problems of timber grading.**] *Deutsche Holzwirtschaft* Nos. 77–79, 1941; *abstr.* in *Forstarchiv* 17, 1941 (301–2). [G.]

A discussion of the psychological and practical aspects of grading. It is believed that the nature of the raw material and the requirements of the consumer could be more effectively reconciled by wider application of the results of research in wood technology, and that rules could be made simpler and more rational than at present, with consequent advantage to all concerned.

33.91 : 33.4 : 12.25. **Factory-fitted Douglas Fir entrance doors. Commercial Standard CS91–41.** U.S. National Bureau of Standards, Washington, D.C. 1941. pp. 22.

33.91 : 31.27 : 12.25. **Grading softwoods for strength. Stress-grades for beams.** *Leafl. For. Prod. Res. Lab.* No. 19, 1941. pp. 7.

The grading rules given for three stress grades of softwoods are suitable for small beams such as joists and rafters; they include the home-grown (British) timbers Scots Pine, European Larch, Douglas Fir, Silver Fir, and Norway Spruce, and some imported species, e.g. European Scots Pine, Western Larch, Red Pine, Ponderosa Pine, Whitewood (Norway Spruce and Silver Fir), Canadian Spruce (*Picea* spp.), Engelmann Spruce, and Sitka Spruce. These timbers are graded into stress grades designated as 1,200 lb. f., 1,000 lb. f., and 800 lb. f., f. denoting stress per sq. in. in bending (flexure).

33.91 : 33.8 : 12.26–8. **Ash handles.** *Simplified practice recommendation* R76–40. U.S. National Bureau of Standards, Washington, D.C. 1940. pp. 13.

Requirements as to colour, annual rings per inch of radius, weight, permissible cross grain, and admissible blemishes are tabulated by grades, the grading of handles to be based on visual inspection.

33.91 : 98.3 (94). WICKETT, H. C. **Standardisation of the standards. Grading rules for timber.** *Aust. Timb. J.* 7, 1940–41 (397, 399, 401, 438). [Timber Control Office, Melbourne.]

A plea is made for evolving grading rules for Australian and imported timbers that would be simple enough to be remembered by a yardsman. This, it is argued, is a necessary condition for a generalized use of standard grading.

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

34.2. *Vegetable Products*

34.2 : 98.1 (66.9). MACKAY, J. H. **Minor forest products.** *Farm & Forest* 2, 1941 (41–5).

The position in regard to minor forest products in Nigeria is reviewed. It is pointed out that while many of these products are of importance in the daily life of the native population there has been little progress in their economic development and that many of them should find a ready export market, and with war shortages of material there should be opportunities for their extended use within Nigeria. The principal minor products exported in recent years are Shea nuts, Shea butter, gum arabic, Niger gutta, beeswax and piassava.

34.24. Tanning Materials. Cork

34.24 (91 : 92) : 98.1. WIND, R. De looistoffenindustrie in Nederlandsch-Indië. **[The tanstuffs industry in the Dutch East Indies.]** *Bergcultures* 15, 1941 (569–74). [Du.] *Repr.* from *Economisch Weekblad* 10, No. 16. H.S.B.

The 1939 production of tanstuffs in the Dutch East Indies was distributed by species as follows:—Bakau Mangrove (*Rhizophora* and *Bruguiera* spp.) 9,062 metric tons; Tengar Mangrove (*Ceriops candolleana*) 3,642 tons; other unspecified kinds 217 tons; Wattle (*Acacia decurrens* var. *mollis*) 475 tons; Pilang (*Acacia leucophloea*), Segawé (*Adenanthera microsperma*), Trenggoeli (*Cassia fistula*), Weroe (*Albizzia procera*), Kesambi (*Schleichera oleosa*), etc., 928 tons; and Gambier (*Uncaria gambir*) ± 13,000 tons. These figures, together with some local production not shown in the statistics, bring the total production to some 30,000 tons, or only 2 per cent. of world production. Most of the species named are slow-growing wild forest trees that are unlikely to assume importance in the export trade, though their produce may be valuable to local tanneries. Only Mangrove and Gambier are at present exported in quantity; the peak for Mangrove tanbark was reached at 11,379 tons in 1937, the 1939 figure being 8,420 tons, while Gambier exports have fluctuated less but reached a peak figure of 7,460 tons in 1939. Exports of these two tanstuffs in recent years have averaged about 6 per cent. of the world trade, which amounts to about 240,000 tons yearly. Wattle, however, is believed to have considerable possibilities as an export crop, and it is thought that production of Wattle bark could be raised by 1950 to about 15,000 tons, of which some 10,000 tons would be available for export. The increasing use of imported tanstuffs in southern and eastern Asia makes it likely that suitable markets could be developed. Wattle plantations in Java amounted to about 10,000 ha. in 1941, but only a fraction of this is as yet under regular exploitation. The most rapid extension of Wattle cultivation in the near future is to be expected in Java, as it is here that the best market for firewood and charcoal wood exists. Since much of the Wattle imports of south-eastern Asia is shipped in the form of ground

bark in pressed bales, a trial plant for this purpose, with a daily capacity of 2,000 kg., was set up in 1938 at Buitenzorg and produced in 1940 a quantity of 465 tons, of which 56 per cent. was of exportable quality. A factory was built at Bandoeng in 1940 and it was hoped to begin production of ground-and-baled Wattle bark early in 1941. Notes are also included on the other species named above.

34.24 : 12.25 (43.1–6). Die Gerbrinde, ein heimischer Rohstoff. **[Tanbark, a home-produced raw material.]** *Internat. Holzmarkt* 1941 (13), (26); *abstr.* in *Holz* 4, 1941 (264). [G.] P.R.

Restriction of imports of tanstuffs has stimulated the production of Spruce tanbark in Germany, and trade in this product is now subject to official regulation.

34.24 : 12.25 : 32.24. FABRICIUS, L. Forstliche Versuche. XXVI. Wiederholung des Versuchs XXIV über Gewinnung der Fichtengerbrinde von Stämmen, die im Winter gefällt sind. **[Forestry experiments. XXVI. Repetition of experiment XXIV on the harvesting of Spruce tanbark from trees felled in winter.]** *Forstwiss. Cbl.* 63, 1941 (169–72). [G.] [Institut für Waldbau und Forstbenutzung der Bayer. Forstl. Versuchsanstalt.]

The results obtained in the previous experiment [cf. *For. Abs.* 3, (153)] have been confirmed by the new set of tests.

34.24 : 12.26–8. MARR, H. V. **Wandoo as a source of vegetable tannin.** *Aust. For.* 6, 1941 (45–9). [Industrial Extracts Ltd., Perth, W.A.]

Note on the manufacture of 'Myrtan' from the wood and bark of *Eucalyptus redunca* var. *elata* and on the uses of this extract. The maximum capacity of existing factories in Western Australia amounts to about 8,500 tons per annum. With the cessation of imports from Continental Europe 'Myrtan' is the only tanning extract of the Oak and Chestnut type at present available in the British Empire.

34.24 : 12.26–8 (81). BUTTRICK, P. L. **Note on Brazilian cork.** *Trop. Woods* No. 68, 1941 (11–3).

The Pau Santo or Pau Santo do Cerrado (*Kielmeyera coriacea* Mart., and possibly other species) of south-central Brazil yields a kind of cork that is locally used for insulation. Under present practice the trees are felled and their bark stripped when they reach 6–8 in. in diameter. The stumps sprout readily, and 4–5 years are said to be required for regrowth between strippings. As with Cork Oak, the first stripping is suitable only for grinding and is therefore restricted in use to insulation. It is not known whether strippings can be made from living trees and crops of secondary cork subsequently grown. The cork-producing region is in dry areas of the northern part of the Province of Minas Geraes and in the central portions of the Provinces of Goyaz (Goiás) and Matto Grosso. The last-named appears to be supplying the present demand, which is confined to two small insulation factories. Pau Santo is said to be the commonest tree of the extensive, low, savanna-like, mixed hardwood forests locally known as cerrados. These cover thousands of square miles, but only the fringes possess any organized transport systems and have been worked for cork. Extensive exploitation would require large capital investment and organization. Present production is about 8,000 tons yearly.

34.26. Resin. Turpentine. Oils. Gums

34.26 : 12.25. HARRISON-SMITH, J. L. **Kauri gum.** *N.Z. J. For.* 4, 1940–41 (284–92).

Kauri gum, the resin produced by *Agathis australis*, is obtained either as 'fossil' gum from the ground or as 'green' gum from the tree. Exports of this commodity from New Zealand in 1939 totalled 2,316 tons valued at £112,650. This was less than one-quarter the amount exported in the peak year 1899. Notes are given on the legislation regulating the collection of and trade in Kauri gum, on the collecting of green and fossil gum, and on the marketing of the gum.

34.26 : 12.25. JENNESS, L. C., and CAULFIELD, J. G. L. **Recovery of Maine Balsam-needle oil.** *Maine Tech. Exp. Sta., Univ. Maine Bull.* 38, 1941 (3–16). Chem. Abs. 35 (6061). P.R.

Chemical and physical properties of Balsam-needle oil are discussed. A still and accessories are described. There was little variation of yield of oil from material collected at different seasons. On account of the small latitude permissible in the specifications for oils of this class, Maine Balsam oils may not meet the requirements for all commercial uses without further processing.

34.26 : 12.25. CHADWICK, T. C., and PALKIN, S. **Composition of American gum turpentine exclusive of the pinenes.** *Tech. Bull. U.S. Dep. Agric.* No. 749, 1941. pp. 15. [Bureau of Agricultural Chemistry & Engineering, U.S.D.A.]

This bulletin deals with the equipment and procedure used in the fractional distillation of gum turpentine derived from Longleaf Pine (*P. palustris*) and with the analysis of the substances obtained.

34.26 : 12.26–8 (66.9). MACDONALD, K. R. **The gum arabic industry in Bornu Province.** *Farm & Forest* 2, 1941 (13–6).

While *Acacia senegal*, which produces the highest quality gum arabic, occurs throughout the Dry Thorn Forests of Northern Nigeria, it is only in Bornu Province between parallels 12° and 13°, that concentrations sufficient for exploitation are available. Since 1928 steps have been taken to promote trade in this product in Nigeria and while progress was slow at first the industry now appears to be established. Exports from the Province for the six years 1935–40 averaged 550 tons per annum.

34.26 : 12.26–8 : 34.25. DUGAND, A. Noticias botanicas colombianas. 2. Sobre la identidad del Caparrapi. [**Colombian botanical notes. 2. On the identity of Caparrapi.**] *Rev. Acad. colomb. Cienc. exact., fis. y nat.* 3 (12), 1940 (392–6). Biol. Abs. 15 (19146).

This tree, which furnishes a medicinal oil, is identified as *Ocotea* (*Nectandra*) *caparrapi*.

34.26 : 33.32. GHOSE, T. P., and VARMA, B. S. **Synthetic tall oil.** *Indian For.* 67, 1941 (395–8). [Forest Research Institute, Dehra Dun.]

A review is made of the production, composition, and uses of natural tall oil derived from waste sulphate liquors, and of the possibility of manufacturing a similar product from native materials in India. Rosin oils prepared by distillation of rosin are suitable for the purpose, except that their acid and saponification values are too low, but a synthetic tall oil of correct specification could be obtained if rosin oil produced by rapid distillation or distillation under reduced pressure were mixed with suitable proportions of fatty acids. Such acids are readily obtained by saponifying fatty oils with alkali, the most suitable oils being those rich in oleic, linoleic, ricinoleic and like acids of high acid value. In normal times the synthetic product could not compete with natural tall oil, but under war conditions its manufacture might be profitable and the initial cost of equipment would be low.

34.26 : 33.37 : 07.7. **Turpentine still building and equipment.** *Misc. Publ. U.S. Dep. Agric.* No. 387, 1940. pp. 43.

Description of types of still buildings recommended by the U.S. Department of Agriculture.

34.27. Seeds. Fruits. Leaf Fodder

34.27 : 12.26–8 : 23 : 60.31. LAMB, A. F. A. **Can Cocoa farmers and foresters be friends?** *Farm & Forest* 2, 1941 (86–9).

The rain forest of Oyo and North Ondo in southern Nigeria may be divided into five storeys, the middle one of which is a more or less closed canopy 20–40 ft. above ground consisting of trees of no value for timber but which are of use for fuelwood and charcoal. This layer, which grows at about the same level at which Cocoa would be grown, affords a dense shade that is unfavourable to the natural regeneration of important high-forest species such as *Chlorophora excelsa* and *Triplochiton scleroxylon*. A plan is proposed for forest reserves in this region whereby the middle-storey trees would be removed, if markets can be developed for the wood, thus releasing the saplings of timber-producing species, and Cocoa, which requires high-forest conditions, would be introduced. The presence of the Cocoa crop would allow of the additional cost of creeper cleaning and this would further benefit the natural regeneration of desirable timber species. Experiments have been started along these lines.

34.27 : 12.26–8 : 31.0. TORTORELLI, L. A. Tratamiento forestal y caracteres xilológicos del maitén (*Maytenus boaria*), árbol forrajero de la Patagonia. [**Forestry treatment and wood properties of *Maytenus boaria*, the forage tree of Patagonia.**] *Rev. Fac. Agron. Vet., B. Aires* 9, 1941 (126–42). [Span.] A.P.B.

34.27 : 12.26–8 : 23.27 : 12.11.22. UYS, C. J. **The Weeping Willow as a fodder tree.** *Fmg. S. Afr.* 16, 1941 (97–9). L.S.

Leaves of *Salix babylonica* have been shown by analysis and tests with chicks to have a feeding value that compares favourably with that of lucerne. They may be fed to all kinds of livestock. The species is a good ornamental and shade tree for farms, and owing to its deep

root system it stands drought well. The wood is useful for many farm purposes and as a fence post it is said to outlast some species of *Eucalyptus*. As with other Willows, propagation by cuttings is very readily effected and large branches or poles can be successfully rooted. All forms of cuttings are best taken and planted just before the budding period. It is recommended that thick pole or branch cuttings should have the basal 2 feet immersed in water for 2–4 weeks or longer before planting out, so that they may take up as much reserve water as possible.

34.28. Palm Products other than Fruits

34.28 : 12.29 : 6 : 23 (922). HEIDEMA, E. J. Nogmaals het niboengvraagstuk. Gezien binnen het rayon van den dienstkring Bengkalis. **[Further observations on the Nibong problem. With special reference to the Bengkalis district.]** *Tectona* 34, 1941 (753–71). [Du.e.]

The best Nibong (*Oncosperma filamentosum*) stands near T. Tengau have 800 exploitable stems per ha., the average for the workable area being 600 per ha. Good stands on a 10-year rotation should produce about 60 stems per ha. each year, provided that proper silvicultural measures are applied. In the marginal stands, forming transitions to Mangroves on one side and to peat-swamp forest on the other, only two-fifths of the Nibong-containing area is regarded as exploitable. The fisheries at Bagan si Api Api require 50,000 Nibong poles per annum, and to supply this quantity more than 2,000 ha. of Nibong-containing forest must be reserved and put under good management. As, however, the forests of this district have been seriously depleted, the proposed reserve would not supply the necessary number of poles for a considerable time to come. Meanwhile the existing stands need careful management, and trials to determine the best silvicultural practice and the most suitable rotation are much to be desired. Further reconnaissance of the forests should also be made to find a tract suitable for departmental exploitation by the Forest Service. [Cf. *For. Abs.* 1 (85).]

34.28 : 12.29 : 23 (66.9). TAYLOR, J. E. **The *Raphia* Palm (*Raphia sudanica* A. Chev.): its propagation and uses in Northern Nigeria.** *Farm & Forest* 2, 1941 (21–4).

34.6. *Utilization of Logging and Milling Waste*

34.6. **Wood flour: Forest Products Laboratory research in its development.** *Wood Products* 46 (12), 1941 (21–2).

Wood flour produced in the United States is made chiefly from mill waste of good quality free from bark and other foreign matter. The principal species used are soft Pines and Spruces. For practically all uses the material should be light in colour, light in weight, fluffy and absorptive. Size varies from 40 to 140 mesh, the bulk of the material being 80 mesh and finer. The three general types of wood flour are (i) non-technical, for which the requirements are not very exacting, (ii) technical, which is made to specified standards, and (iii) granularmetric, in which the particles are uniform in size and character. The principal uses for wood flour are linoleum and dynamite. The manufacturing processes are described briefly.

34.6 : 33.7 : 33.06. GILLHAM, R. B. **The utilization of wood refuse for steam raising.** Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1. 1942. pp. 12.

Detailed description of an installation designed by the author, comprising a collection and delivery system; a storage silo and feeding mechanism; and the required boiler accessories.

34.6 : 33.7 : 33.06. Die wirtschaftliche Verfeuerung von Holzabfällen mit Zusatz anderer Brennstoffe. **[Economical firing with wood waste supplemented by other fuels.]** *Brennstoff- u. Wärmewirtsch.* 22, 12, 1940 (187–9); *abstr.* in *Holz* 4, 1941 (265). [G.] P.R.

38. FOREST CONSTRUCTIONAL WORKS. ENGINEERING

38.2. STERN, E. G. **Modern timber-construction methods in Europe.** *Mech. Engng. N.Y.* 63, 1941 (707–12). [Virginia Polytechnic Institute, Blacksburg.] L.S.

Descriptions, illustrations and diagrams are given of (i) the G- or Goldes beam, a built-up wooden beam with steel reinforcement that effects a 60-per-cent. saving in timber as compared with simple wooden beams of the same load-carrying capacity; (ii) the Ludwig Kroher (L.K.) timber roof construction, which gives a timber saving of 40–70 per cent.; (iii) the Vollmar roof-truss construction, which saves 43

per cent. in timber; (iv) a three-hinged, nailed, box-like timber truss; and (v) two types of timber connectors.

38.2. HOLTMAN, D. F. **Heavy timber construction. Part III.** *Timber of Canada* 2 (1), 1941 (36–50). [National Committee on Wood Utilization.]

Detailed notes and drawings with reference to roof and bridge trusses, and airplane hangars.

38.2. MCCONNEL, S. **Engineering structures in timber; use of scientific methods in design.** *Civ. Eng. P.W. Rev.* 35 (414), 1940 (350–2). Building Sci. Abs. (*n.s.*) 14 (652). P.R.

38.2 : 33.36.2. **Fire stops for timber roofs.** *D.S.I.R. Building Research Wartime Building Bulletin* No. 18, 1941. pp. 13. P.R.

38.2 : 33.4. **The uses of timbers: Large timber structures.** *Mon. News Lett. Div. For. Prod. Aust.* No. 118, 1941 (4).

The use of timber connectors and the consequent change in design and methods of construction has resulted in an increased use of timber in large structures, particularly roofs. It is pointed out that care should be taken in grading timber for this work and that provision should be made for the fact that timber structures deflect more than steel structures of the same strength.

38.3 : 07.7. WICKETT, H. C. **Tractors and their accessories. Comparative notes on the types of equipment available and their usefulness in tram and road formation.** *Aust. For.* 6, 1941 (11–3).

From his experience of various road-building tractors the author recommends the use of a Diesel track-type tractor of 70 to 95 h.p., with a front-operated, cable-controlled angledozer and with a logging winch and canopy top permanently attached.

38.3 : 32.91 : 33.02 : 76.1. BENNETT, A. L. **Construction of low cost pulpwood roads.** *J. For.* 39, 1941 (903–6). [Armstrong Forest Co.]

A brief note on the location, with the aid of aerial photos, and the method and costs of construction of logging roads of simple design that will be paid for by the produce removed. The scheme described included permanent, semi-permanent and feeder roads.

38.3 : 32.91 : 76.1. REYNOLDS, R. R. **Economical spacing of forest roads.** *Sth. Lumberm.* 163 (2057), 1941 (165–8). [Southern Forest Exp. Sta.]

Factors that affect the economical spacing of woods roads include:—(1) volume per acre to be removed; (2) hauling cost from the stump to the roads; and (3) cost of construction of the roads. Figures are tabulated for the spacing distances of graded dirt roads for various log sizes, construction costs, and cuts per acre, and for both good and poor hauling conditions. On selectively cut areas the cost of road construction should be allocated to successive cuts.

4. FOREST INJURIES AND PROTECTION

42. INJURIES FROM INORGANIC AGENCIES, EXCLUDING FIRE

42.1. *Air Currents*

42.1. MEYER, K. A. Durch Wirbelsturm vernichtete Wälder. **[Forests destroyed by a cyclone.]** *Schweiz. Z. Forstw.* 92, 1941 (228–30). [G.]

Notes on the damage caused by the cyclone of 13th July, 1941, in the town forest of Frankfurt a. M. About a quarter of a million trees are said to have been uprooted or broken within fifteen minutes.

42.1 : 23.27. PIRONE, P. P. **Freak weather damages trees and shrubs.** *New Jersey Agriculture* 23 (3), 1941 (1). L.S.

In spring, 1941, wilting and browning of many evergreen ornamentals, including Yews, Junipers and White Pine, was widespread in the Atlantic seaboard region of the United States. The damage, which was most severe in recently transplanted trees and those with poor root systems or on unfavourable sites, is attributed to strong polar winds in March, which caused leaves to transpire more water than could be replaced from the frozen soil, followed by exceptionally mild weather and a heat wave in early April. Damaged plants should be watered during drought periods and deep, permanent mulches should be built up.

42.2. *Temperature Influences*

42.21 : 12.26–8 : 12.11.3. GRAUMANN. Frostwirkung an ostpreussischen Eichen von verschiedener Herkunft. **[Effect of frost on East Prussian Oaks of different seed origin.]** *Z. Forst- u. Jagdw.* 73, 1941 (283–7). [G.]

It is reported from a district in East Prussia that Pedunculate Oak stands grown from local seed resisted the severe winter frost of 1939–40 far better than those grown from west-German seed.

42.22 : 21.2 : 12.26–8. MAGGRETT, H. I. **The ability of certain common trees to withstand drought in southeastern South Dakota.** *Proc. S. Dakota Acad. Sci.* 20, 1940 (84–90). Biol. Abs. 15 (19670).

The percentage survival values of some common trees, as shown by a field survey extending from 1934 to 1939, were Red Cedar 97, Chinese Elm 97, Hackberry 96, Ponderosa Pine 92, Honey Locust 88, Bur Oak 85, American Elm 79, Cottonwood 78, Green Ash 63, White Willow 63, Boxelder 56, and Black Walnut 55. The average survival value for all was 76 per cent.

42.3. *Precipitations*

42.3 : 12.25 : 22.89 : 24. KIENHOLZ, R. **Jack Pine in Connecticut damaged by sleet storm.** *J. For.* 39, 1941 (874–5). [Conn. State Department of Forestry.]

Jack Pine plantations in southwestern Connecticut were severely damaged by a heavy sleet storm, while nearby Scots, White and Red Pine were only slightly injured. Breakage of Jack Pine was greatest in trees of the smaller diameter classes in the interior of the plantations, few of the unpruned border trees being injured. Responsibility for the damage was partly due to the treatment of the plantations, as the trees had been planted at 6 ft. by 6 ft. spacing, had never been thinned, and had been pruned high up the bole, resulting in a stand of tall, spindly trees with crowns close together.

42.33 : 12.25 : 22.88.2. STONE, E. L., and SMITH, L. F. **Hail damage in second-growth Longleaf Pine.** *J. For.* 39, 1941 (1033–5). [Southern Forest Exp. Sta.]

Damage by hail in young stands of Longleaf Pine included almost complete defoliation of many trees and the wounding of the bark on the north side of young stems. Many of the injured trees were subsequently attacked by *Ips* sp. which caused considerable mortality. Surviving trees that were badly defoliated showed a marked reduction in diameter growth.

42.5. *Chemical Influences. Nutrient Deficiencies*

42.5 : 12.25 : 21.2 : 21.32 : 11.47.13 : 11.43.1. NEILSON-JONES, W. **Fused needle disease of Pines.** *Emp. For. J.* 20, 1941 (151–61). [Bedford College, University of London.]

The occurrence at Wareham Forest, Dorset, of fused needle in plantations of Corsican Pine, Mountain Pine, and Scots Pine, species not hitherto recorded as susceptible, is described. Included are records of fused needle affecting *P. contorta* in Wales, Mountain Pine in Yorkshire, and *P. halepensis* in Arizona.

Observations and experiments by the writer have shown that:—(*a*) Recovery from fused needle occurs immediately by providing conditions that favour short root production and the establishment of a normal mycorrhizal system; also that the incidence of fused needle is associated with the arrest of short root development and mycorrhiza formation rather than that with consistent poverty of mycorrhizas. (*b*) Fused needle is not transmitted by grafting. (*c*) It is not due to a deficiency of zinc or boron. (*d*) The degree of incidence is reduced by phosphatic dressings, probably as a result of direct stimulation of fungal activity.

Some aspects of Young's monograph on fused needle in Australia [cf. *For. Abs.* 2 (322)] are considered critically, and while agreement is reached on most of the views put forward, exception is taken to the 'carbohydrate hypothesis' as a basis for the development of symptoms of fused needle.

A new hypothesis is presented in which the appearance of fused needle is ascribed to a sudden shortage of water in the plant at the time the leaves are beginning to expand, the deficiency arising from greatly reduced root absorption owing to failure of the root system to provide functional short roots and mycorrhizas at this critical period in the life cycle. *From author's summary.*

43. FOREST FIRES

43.0. *Predisposing Factors and Causes*

43.0. **Forest fire danger.** New Brunswick Forest Service, Fredericton, N.B. 1941. pp. 36 + 4.

This bulletin contains all the necessary information and instructions for the operation of the Wright System of forest fire danger determination in New Brunswick. [Cf. *For. Abs.* 1 (186), 2 (243).]

43.0. BEALL, H. W. **What the forest-fire hazard index means in terms of actual fire conditions in Riding Mountain and Prince Albert National Parks.** Dominion Forest Service, Ottawa. 1941. pp. 3 + gphs.

Experience has shown that even in its present stage of development the administration hazard index (Wright System) is a useful and reliable indicator of fire occurrence and behaviour in this region.

43.01 : 11.12. MORRIS, W. G. **Comparison of 1-, 2-, 4-, 6-, and 8-minute wind-velocity measurements.** *Fire Control Notes* 6, 1942 (25–7). [Pacific Northwest Forest & Range Exp. Sta.]

43.1. *Protective Measures*

43.1. ABELL, C. A. **Rates of initial spread of free-burning fires on the National Forests of California.** *Res. Note Calif. For. & Range Exp. Sta.* No. 24, 1940. pp. 26.

Chiefly a set of curves showing the rates of initial spread as calculated for each important inflammability zone in the different forests. The data presented are the result of recorded observations on more than 9,500 fires.

43.1 (78.6 : 79.6–7). LINDH, A. G. **Fire control methods of the Forest Service, Northern Rocky Mountain Region.** *Northwest Science* 15, 1941 (34–46). [U.S. Forest Service, Missoula, Mont.] L.S.

A broad review is made of the principles that have governed the evolution of the fire-control plan for this region, and of the organization developed for fire protection. The effectiveness of such planning is shown by comparison of figures for the annual area burnt over in past and in recent years, e.g. in 1910–14 the average area burnt annually amounted to 23,797 acres per million acres protected, in 1935–39 the corresponding figure was as low as 1,023 acres, and in 1940—an unusually severe fire season with a record number of fires—only 1,474 acres were burnt over per million acres under protection. Average protection costs per acre, excluding depreciation and maintenance costs of improvements—most of which are also used for other activities—but including fairly large costs for the building up of capital investment in equipment, have been 3·6 cents per annum during 1925–29, 4.2 cents p.a. in 1930–34, and 3·1 cents p.a. in 1935–39.

43.1 (79.5) : 92 : 85 : 60.31.2. DREESEN, W. H. **Financing fire protection for timber lands under Oregon laws.** *Sta. Bull. Ore. agric. Exp. Sta.* No. 384, 1940. pp. 27.

Owners of timber lands may provide the protection required under the State laws either individually or through membership of a private forest-protective association. Where the owners fail to provide protection for their timber lands, the State Forester arranges to protect these lands directly through his own department or contracts for their protection with a private forest patrol association or the National Forest Service. The costs of such protection are charged against the owner.

43.1 (931) : 92. NEW ZEALAND. **State Forest Service. Annual report of the Director of Forestry for the year ended 31st March, 1941.** Govt. Printer, Wellington. 1941. pp. 50.

New regulations with respect to forest-fire protection include provisions 'that a permit to burn given under the fire-district law shall not discharge the permittee from liability for damage caused by any fire lighted by him pursuant to such permit' and 'that no such permit is to be acted upon at the time mentioned therein if a heavy wind is blowing or if conditions are such as might cause a fire to spread beyond the limits of the area over which the permit is granted' (p. 17).

43.1 : 81 (75.2). MARSH, S. H. **Emergency fire plan for the eastern shore of Maryland.** *Fire Control Notes* 6, 1942 (1–3). [Eastern Region, U.S. Forest Service.]

Using aerial photographs and supplementing these by studies on the ground, natural barriers to the spread of forest fires were mapped and the character of gaps in these barriers and possibilities of defending these gaps were examined. The information thus gained led to considerable improvements in local suppression planning.

43.1 : 81 : 07.7. **Radiophone manual.** British Columbia Forest Service, Victoria. [Revised ed.] 1940. pp. 33.

This manual describes the radio equipment in use by the British Columbia Forest Service and gives instructions for its operation and also for the recording of weather observations from lookout stations.

43.1 : 81 : 07.7. **A push button tuning portable radio.** *Fire Control Notes* 6, 1942 (37–8).

Description of a portable radiophone weighing about 10 lb. and having a working range of at least 3 miles.

43.1 : 81 : 07.7. **Short-wave radiophones speed up fire-fighting.** *J. For.* 39, 1941 (875–6).

Recent additions to the radio equipment used in fire protection work include a bell-ringing radio for lookout towers, automatic radio relay stations, which automatically re-broadcast messages from smaller radios, and a cheap mobile radio transmitter for use on fire trucks and other vehicles.

43.12. STEWART, D. W. R. **The development of tree lookouts for fire detection in W.A.** *Aust. For.* 6, 1941 (5–8).

Description of the methods of tree-lookout construction that have been adopted in the forestry divisions south of the Blackwood River. The height to the cabin on top of the tree varies from 90 to over 150 ft. The spiral ladder-way by means of which the tree is climbed is sometimes enclosed with a wire structure for greater safety.

43.12 : 38.2. PRYOR, L. D., and WICKETT, H. C. **Fire lookout on an erected pole.** *Aust. For.* 6, 1941 (42–4).

A fire lookout set on a pole 40 ft. high is described. The possibility of erecting poles 100 to 150 ft. high for lookouts is discussed, and a design for a concrete plinth that is termite-proof and allows of periodical creosoting of the pole butt is included.

43.12 : 07.7. ZACH, L. W. **A type of map-board and protractors for dispatcher use in locating fires.** *Fire Control Notes* 6, 1942 (29–30). [Oregon State College.]

The device described is claimed to render more convenient the location of a fire on the map by intersection of the bearings taken at two lookouts.

43.12 : 61.32 : 07.7. BELOV, S. V. **An instrument for determining the area of a [forest] fire from the air.** *Lesnoe Khozyaystvo, Moscow* 1941 (6), (52–3). [R.] L.S.

The special telescope described allows of determining with fair precision the size of fire areas not exceeding 16 ha. The measurement is taken from a height of 500–1,000 m., the deviation from the vertical not exceeding 30°. The objective of the telescope is divided into squares which, with the necessary adjustments to the instrument, represent 1 ha. each.

43.13 : 07.7. **Oil cure for loose handles.** *Fire Control Notes* 5, 1941 (203).

More than 2,000 fire tools (axes, pulaskis, and hammers) were treated by injecting oil into the handles, and as a result loose handles have decreased more than 75 per cent.

43.13 : 07.7. WRIGHT, J. G. **A device for repairing linen fire hose.** Dominion Forest Service, Ottawa. 1941. pp. 8 + illus.

With the aid of the vulcanizing unit described, sections of linen fire hose can be spliced together at a moderate cost. The repairs were found to withstand water pressures up to 400 lb. per sq. in.

43.13 : 07.7. WRIGHT, J. G. **A variable stream nozzle for trombone type hand-spray pumps.** Dominion Forest Service, Ottawa. 1940. pp. 3 + illus. & gph.

43.13 : 07.7. WRIGHT, J. G. **Performance tests on Paramount Cub Pumper.** Dominion Forest Service, Ottawa. 1940. pp. 6+gphs.

Data on the design and performance of a back-packing unit that was developed after extensive tests on all Canadian-made forest-fire pumps by the Petawawa Forest Experiment Station and the National Research Council.

43.13 : 32.29.1 : 07.7. **Power saws for snag falling.** *W. Cst. Lumberm.* 68 (12), 1941 (59).

Petrol-powered saws have definite advantages over hand-powered saws in felling snags, particularly where speed and endurance are required in fire-control cutting.

43.13 : 32.29.1 : 07.7. LOWDEN, M. S. **A 'pusher' for snags.** *Fire Control Notes* 5, 1941 (201–2). [Deschutes National Forest.]

A large saving in snag-felling costs has been effected in the Deschutes National Forest during the last two years through the use of a snag-felling machine, which has reduced the average cost of felling Ponderosa Pine snags in hazard-reduction work in fire lanes to approximately half that of manual work with crosscut saws. The machine consists of a 40-ft. boom held in place by cables and mounted on a caterpillar tractor. The end of the boom is fitted with triangular teeth cut from $\frac{3}{4}$-in. boiler plate which catch on and assist in preventing the boom from slipping from the snag. Beetle-killed snags up to 36 in. in diameter and 150 ft. in height are pushed without difficulty. With a

two-man crew the machine pushes 200 snags per day in clearing fire lanes 300 ft. wide.

43.13 : 81. OLSEN, C. F. **An analysis of the Honey Fire.** *Fire Control Notes* 5, 1941 (161–78). [Southern Forest Exp. Sta.]

Description of a fire with an extremely high rate of spread which occurred in the Kisatchie National Forest and of the suppression action taken. Suggestions are made on the planning of suppression work under similar conditions.

43.13 : 81 : 82. ELLIOTT, R. **The Willamette Flying 20.** *Fire Control Notes* 5, 1941 (179–82). [Willamette National Forest.]

Twenty fire guards normally performing regular guard duties at their own stations were trained to act as one suppression crew in emergency cases, when they assembled at an agreed place and were equipped. The organization of the crew is discussed.

43.13 : 81 : 82 : 07.7. MITCHELL, J. A. **A fire-dispatching guide for use in the Lake States.** *Fire Control Notes* 6, 1942 (16–8). [Lake States Forest Exp. Sta.]

This guide is designed to indicate the man-power required to control forest fires in northern Minnesota, Wisconsin, and Michigan within the time allowed by local Forest Service standards. The device is a slide rule with scales for each of four factors which, when combined, indicate the average number of men required to control fires with hand tools under given conditions. The factors used are:—(1) Danger or burning conditions as indicated by the Lake States fire-danger meter; (2) wind velocity; (3) travel time; and (4) fuel-type class based on rate of spread and resistance to control.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

44.2. *Parasitic Higher Plants*

44.2 : 12.26–8 (944). MAY, V. **A survey of the mistletoe of New South Wales.** *Proc. Linn. Soc. N.S.W.* 66, 1941 (77–87). L.S.

Consideration is given to the economic effect of mistletoe (species of *Loranthus*, *Phrygilanthus*, *Notothixos*, *Korthalsella*, and *Viscum*), its distribution in New South Wales with reference to host species, and possible methods of control. Most trees of New South Wales appear to be potential hosts to mistletoe in some district, even if apparently immune in one particular locality.

44.3. *Fungi*

44.3 : 12.11. WINGARD, S. A. **The nature of disease resistance in plants.** *Bot. Rev.* 7, 1941 (59–109). [Virginia Agric. Exp. Sta.]

44.3 (931). NEW ZEALAND. **State Forest Service. Annual report of the Director of Forestry for the year ended 31st March, 1941.** Govt. Printer, Wellington. 1941. pp.50.

The brown cubical heart rot of Kaikawaka (*Libocedrus bidwillii*) was found to be caused by *Polyporus brounii*. Infection appears to take place at the top of snow- and wind-damaged trees and to spread downward, completely destroying the heartwood. Other diseases investigated included a brown heart rot of *Olea cunninghamii* caused by *Fomes* sp., white pocket heart rots of *Elaeocarpus dentatus* caused by *Trametes* sp. and *Fomes zelandicus*, the white pocket heart rot of *Dacrydium cupressinum* caused by *Polyporus proprius*, and the white heart rots of *Weinmannia racemosa* caused by *Polyporus berkeleyi* and *Fomes zelandicus* (p. 19).

44.3 : 12.25 : 12.26–8 : 12.21. WATERMAN, A. M. **Diseases of shade and ornamental trees: annotated list of specimens received in 1940 at the New Haven office, Division of Plant Pathology.** *Plant Dis. Reptr.* 25, 1941 (181–6). R.A.M. 21 (53).

The list includes *Macrophoma* sp., causing a leaf blight of *Cupressus arizonica* in Alabama and Texas, and *Hendersonia magnoliae*, causing a leaf spot of *Magnolia grandiflora* in Virginia. Further investigation is necessary to determine whether the former fungus is a new species or identical with *Macrophoma cupressi* (Cke. & Hark.) Berl. & Vogl.

44.3 : 12.25 : 12.21 : 23.26. HAHN, G. G. **Reports of Cedar blight in 1940 and notes on its previous occurrence in nurseries.** *Plant Dis. Reptr.* 25, 1941 (186–90). R.A.M. 20 (550).

In recent years, *Phomopsis juniperovora* has become a difficult problem in nurseries of the Mississippi Valley States where Cedars are propagated, and the disease is regarded as particularly serious in this area since *Juniperus virginiana* is locally popular for windbreak plantings. In two nurseries in Iowa and Missouri the disease was less active in July, 1940, than at any time in the previous 3 years, apparently owing to a very dry spring. Towards the end of July, however, an epidemic developed in two Iowa nurseries and became

more severe than outbreaks in 1937 and 1938. In a 2-acre area planted with *J. virginiana* all of 2,000 seedlings examined were infected. Spread became greatly reduced in the first week of September, when dry weather set in. Between 20th July and 1st September, the whole stock was rogued 3 or 4 times, with a total loss of about 30 per cent. The disease was quiescent during the dry, cold spring, but became rampant when exceptionally wet, cool weather developed in July and August. In eastern Nebraska infection was worse during 1940 than at any other time in recent years. At Fremont *J. scopulorum* was as badly infected as *J. virginiana*. In Minnesota and Wisconsin infection was light. During the year the first authenticated record of the disease as a nursery problem in Oklahoma was received. In Texas nurseries only one case appears to have occurred; this was in 1929, when the fungus was identified on *J. chinensis* seedlings introduced from Illinois. Infection in a nursery in Virginia and one in North Carolina was less serious than in the previous 2 years. Thin stands appeared to be a controlling factor, as in South Carolina, where the disease has not yet been recorded.

44.3 : 12.25 : 12.21 : 23.26.3. **Transplants killed by *Nectria cucurbitula*.** *Gdnrs.' Chron.*, Ser. 3, 110, 1941 (20). O.B.D.

Cases have recently occurred of the death of transplants in forest nurseries due to *N. cucurbitula*, which is fairly common in Europe on Norway Spruce but has also attacked Larch in Britain. The fungus is first evident as white spots bearing the conidiophores, about the collar region. In the ascigerous stage these spots turn a deep red. The fungus is a wound parasite, and one of the most likely causes of injury is careless use of the spade when levelling the soil after lining out.

44.3 : 12.25 : 12.21. GOSSELIN, R. Notes sur le *Polyporus circinatus* Fr. [**Notes on *Polyporus circinatus* Fr.**] *Ann. Ass. canad.-franç. Sci.* 7, 1941 (104). [F.] R.A.M. 21 (57).

P. circinatus, the agent of a white pocket rot of the base of conifers, is widespread in Quebec on *Picea* spp., especially *P. rubra*, entering its host through the tap roots. Special environmental conditions, whose exact nature has not yet been determined, are necessary for the development of the fungus.

44.3 : 12.25 : 12.21 : 31.42.11. POMERLEAU, R., and MORAIS, L. Les caries de l'épinette noire à Duchesnay. [**Black Spruce rots at Duchesnay.**] *Ann. Ass. canad.-franç. Sci.* 7, 1941 (103). [F.] R.A.M. 21 (57).

Of 277 *Picea mariana* trees examined at Duchesnay in 1939, 46 were infected by one or more forms of decay. *Fomes pini* was responsible for 69·5 per cent. of the cases, involving 86·2 per cent. of the total volume, corresponding figures being 17·3 and 5 per cent. for *Stereum sanguinolentum*, and 13 and 2·8 per cent. for *Poria subacida*, respectively. Other unspecified defects accounted for 4·6 per cent. of the volume. *Fomes pinicola* and *Armillaria mellea* caused secondary rots of wounded and dead areas.

44.3 : 12.25 : 12.21 : 12.26–8. HEDGCOCK, G. G. **Notes on *Coleosporium jonesii* (Pk.) Arthur.** *Plant Dis. Reptr.* 25, 1941 (244–9). R.A.M. 20 (613).

Coleosporium jonesii has long been known as a Rocky Mountain rust, but of late years its range has been extended to Minnesota, Washington, and Wisconsin. Its aecidial host, *Pinus edulis*, is most abundant in Colorado, where the fungus is epidemic on wild *Ribes* spp. up to 9,000 ft. above sea level. *Ribes inebrians* and other native species, except *R. americanum*, which is rarely infected, are the chief alternate hosts of the rust, cultivated gooseberries being seldom attacked and garden red currants apparently immune. The characters of *C. jonesii* are compared with those of other rusts and an account is given of inoculation experiments in which many species of *Ribes* but only two of Pine—*P. edulis* and *P. pinea*—proved susceptible to *C. jonesii*.

44.3 : 12.25 : 12.21. WELLNER, C. A. **Blister rust control in relation to White Pine silviculture.** *Idaho Forester* 23, 1941 (13–5). [Nth. Rocky Mt. Forest & Range Exp. Sta.]

Examples are given to show the need for correlating blister-rust control work and silvicultural practices in the management of Western White Pine stands.

44.3 : 12.25 : 12.21. HULBARY, R. L. **A needle blight of Austrian Pine.** *Ill. nat. Hist. Surv. Bull.* 21, 1941 (231–6).

A hitherto undescribed Phomaceous fungus causing needle blight of *Pinus* spp. is published as *Dothistroma pini* gen. et sp. nov. The new genus is most closely related to *Hemidothis* and *Septocyta*. The description is based on material from *Pinus nigra* var. *austriaca* in northern Illinois, but records of the fungus are also

presented from Iowa, Ohio, and Oklahoma, the present known host species being *P. nigra* var. *austriaca* and var. *calabrica*, *P. flexilis*, and *P. resinosa*.

44.3 : 12.25 : 12.21. Olson, A. J. **A root disease of Jeffrey and Ponderosa Pine reproduction.** *Phytopathology* 31, 1941 (1063–77). [Red River Lumber Co., Westwood, Calif.]

Descriptions are given of a root disease of Jeffrey and Ponderosa Pine on a cut-over area at Lasco, Lassen County, California, and of the causal fungus, *Cunninghamella meineckella* sp. nov. The disease, which has as yet been of little economic importance, causes an infiltration of pitch in affected roots and root collars and may ultimately result in the death of trees. Diseased trees are always found adjacent to old stumps, and their root systems are in contact either with those of stumps or with those of other infected trees. *C. meineckella* was consistently isolated from diseased roots and its pathogenicity was proved by inoculation and re-isolation. Inoculations of roots of seedlings and saplings over 2½ years old caused disease in 100 per cent. of the cases, but younger seedlings appeared to be less susceptible. Contact inoculations in the woods on Jeffrey Pine saplings produced the disease in 100 per cent. of the roots inoculated, proving that the disease can be spread by root contacts. No disease was produced by inoculations of Sugar Pine, White Fir, and Incense Cedar saplings. The optimum growth temperature for the fungus ranges from 22·0° to 25·5° C.

44.3 : 12.25 : 12.21 : 23.26. Davis, W. C. **Damping-off of Longleaf Pine.** *Phytopathology* 31, 1941 (1011–6). [Bureau of Plant Industry, U.S.D.A.]

The persistent rosette habit of Longleaf Pine seedlings leads to unusual damping-off symptoms and lengthens the period of susceptibility. *Rhizoctonia* sp. has been most frequently isolated from diseased seedlings; species of *Pythium* have not been isolated. Tests indicate that a pre-sowing treatment of the soil with formaldehyde will probably not reduce late losses materially, nor will spraying the seedlings with bordeaux or Cuprocide. Ferrous sulphate and ortho-phosphoric acid, separately or in combination at sowing time, reduced losses in some nurseries. Most consistent chemical control was obtained by sprinkling the seedlings with Semesan; this should be done in late afternoon or on cool or cloudy days in order to avoid 'burning'. In most nurseries it seems likely that use of highly viable seed, combined with sowing in shallow rows and covering the seed to about ¼ in. with sawdust (preferably old), or broadcast-sowing the seed, firming it in the soil, and subsequently covering it with sawdust, will afford the most practical methods of control. It appears that added protection from damping-off would be obtained by adopting weeding and cultivation practices that tend to keep the soil away from the bases of the seedlings. *From author's summary.*

44.3 : 12.25 : 12.21. Andrews, S. R., and Gill, L. S. **Western red rot control for the Black Hills.** *J. For.* 39, 1941 (817–23). [Bureau of Plant Industry, U.S.D.A.]

An examination of 1,582 Ponderosa Pine trees in the Black Hills showed that the incidence of western red rot in first logs varied directly with age and d.b.h. and inversely with stand density and was concentrated in trees that had one or more dead branches larger than 1·5 in. d.i.b. below a height of 17 ft. In undertaking stand-improvement work a considerable reduction in ultimate decay loss can be effected in those stands up to 80 years old, where the predominating diameters exceed 6 in., by pruning only small-branched trees as crop trees. Thinning in dense young stands is likely to result in an increase of average branch size and thereby to increase the possibilities of western red rot infection. *From authors' summary.*

44.3 : 12.25 : 12.21 : 12.26–8. Snell, W. H. **The relation of cultivated red currants to the White Pine blister rust in New York State.** *J. For.* 39, 1941 (859–67). [New York Department of Conservation.]

The studies described definitely indicate that the cultivated garden varieties of red currants are not important in the spread of the White Pine blister rust (*Cronartium ribicola*), there being little evidence of infection of either native or planted White Pine from red currants even at very short distances.

44.3 : 12.25 : 12.21 : 23.26. **Leaf scorch of Douglas Fir.** *Gdnrs'. Chron.*, Ser. 3, 110, 1941 (2). R.A.M. 20 (504).

This disease, due to *Rhabdocline pseudotsugae*, is most serious in England on the Blue Douglas and Intermediate or Fraser River varieties, though the Oregon variety sometimes shows slight damage. Nursery stock and trees up to 30 years old suffer most. Individual trees have been observed to remain healthy when

growing in affected nurseries, and these should be kept to form the final crop and as seed-bearers. All infected stock should be cut out, and young stock in the nursery should be sprayed with Bordeaux mixture or lime-sulphur.

44.3 : 12.25 : 12.21. TENG, S. G. **Supplement to higher fungi of China.** *Sinensia* 11, 1940 (105–30). R.A.M. 21 (45).

Chrysomyxa tsugae sp. nov., closely related to *C. abietis*, is described from *Tsuga yunnanensis* in the Hunba Forest, Sikang. Mostly isolated, young, overtopped trees are attacked, being sometimes almost completely defoliated.

44.3 : 12.26–8. DEARNESS, J. **New species of Tennessee fungi.** *Mycologia* 35, 1941 (360–6). R.A.M. 21 (47).

The new species listed include *Phyllosticta hesleri* on *Acer saccharum*; *Phlyctaena tiliae* on *Tilia americana*; and *Cladosporium epiphyllum*, which is possibly the cause of circular, dark leaf spots on *Robinia pseudoacacia*.

44.3 : 12.26–8 : 12.21. GROVES, J. W. ***Pezicula carnea* and *Pezicula subcarnea*.** *Mycologia* 33, 1941 (510–22). R.A.M. 21 (54).

Detailed descriptions and cultural and taxonomic notes are given on *P. carnea* on *Acer* spp. —most commonly *A. rubrum*, and *P. subcarnea* sp. nov., collected only on *A. pennsylvanicum*. Both species have a typical *Cryptosporiopsis* conidial stage.

44.3 : 12.26–8 : 12.21. POMERLEAU, R. Notes sur les maladies de l'érable à sucre. **[Notes on Sugar Maple diseases.]** *Ann. Ass. canad.-franç. Sci.* 7, 1941 (103–4). [F.] R.A.M. 21 (54).

Several new diseases of Sugar Maple have been studied in Quebec, including a trunk canker caused by *Eutypella parasitica*, pure cultures of which were readily obtained and used in inoculation experiments.

44.3 : 12.26–8 : 12.21 : 23.26. MADARANG, S. A. ***Rhizoctonia* damping-off of *Cinchona* seedlings.** *Philipp. J. For.* 4, 1941 (105–21). [Bureau of Forestry, Philippines.]

Damping-off due to *Rhizoctonia* constitutes a major disease of *Cinchona* seedlings in the Philippines. Morphological and cultural characters of the fungus isolated closely resembled those of *R. solani*. From a few inoculation tests made on other hosts, *Rhizoctonia* isolated from *Cinchona* appears to have a narrow host range. This may indicate that the *Cinchona* fungus is a specialized strain of *R. solani*. Sterilization of the soil either by steam pressure or a 1:50 solution of formalin applied at the rate of 2·5 litres per sq. ft. of soil 3–4 in. deep before the soil is used for seed germination effectively checked damping-off of *Cinchona* seedlings.

44.3 : 12.26–8 : 12.21. WOLF, F. A., and DAVIDSON, R. W. **Life cycle of *Piggotia fraxini*, causing leaf disease of Ash.** *Mycologia* 33, 1941 (526–39). R.A.M. 21 (54).

This species was shown to be polymorphic, with a conidial stage—*Marssonia fraxini*, a spermogonial and carpogonial stage—*Piggotia fraxini*, and a perithecial stage identified with *Mycosphaerella effigurata*. All attempts at artificial infection in the laboratory and greenhouse were unsuccessful, but when old leaves bearing perithecia were attached to twigs of healthy trees in the forest the conidial stage appeared on the young foliage after 3 weeks or more, and infection also resulted when leaves bearing conidia were attached to healthy twigs. In nature this species is commonly associated with other fungi.

44.3 : 12.26–8 : 12.21. BENDER, T. R. ***Fusarium* die-back of American Holly.** *Plant Dis. Reptr.* 25, 1941 (403–6). R.A.M. 21 (19).

Trees of *Ilex opaca* in New Jersey were observed in 1940 to be affected by a branch and twig die-back that had first appeared on a single old tree in 1935. An early symptom was the wilting of the current season's growth, which was often defoliated. Infection usually started at the tip of the twig and spread rapidly downwards. Newly killed twigs and leaves were black. Affected twigs showed a brown discoloration of the cortex and pith, with a general breakdown of cell structure in the pith; xylem cells were unaffected. The most conspicuous symptom was the flagging of affected older branches. When the bark of the older stems was cut away in the diseased part, a brownish-black discoloration of the cortical tissue was evident, often extending longitudinally to a distance of 5–6 in., and in advanced stages girdling the stem. Diseased material constantly showed the presence of a fungus tentatively identified as *Fusarium solani* var. *martii*. Inoculations showed that the fungus is capable of entering the plant directly through very young leaves, wounds in young and old stems, and perhaps through terminal portions of unwounded shoots of the current year. It may possibly also enter through the flowers. All

infected branches and fallen leaves should be burnt; pruning wounds and mechanical injuries should be treated with an antiseptic and a wound dressing.

44.3 : 12.26–8 : 12.21. MILLER, P. W. **Walnut blight control in Oregon.** *Ext. Circ. Ore. St. Coll.* No. 359, 1941. pp. 4. [Bureau of Plant Industry, U.S.D.A.]

Recommendations are given on spray formulae and spraying programmes for Walnut orchards infected with *Phytomonas juglandis*.

44.3 : 12.26–8 : 12.21 : 23.26. EZEKIEL, W. N., and NELSON, C. **Sclerotial seedling blight of Black Walnut.** *Plant Dis. Reptr.* 25, 1941 (336–7). R.A.M. 20 (614).

On 22nd May, 1941, *Juglans nigra* seedlings about 3 weeks old and 6 in. high in a nursery bed near Alto, Texas, were found to be dying, apparently as a result of infection by *Sclerotium rolfsii*. By 6th June most of the plants were dead, 100 or so isolated seedlings scattered throughout a long bed having been killed. Not more than 2 or 3 affected plants were found in any one place, usually only a single plant, apparently representing an initial infection, had been attacked. Every diseased plant examined showed *S. rolfsii* strands and typical small sclerotia over the crown, and frequently over the parent nuts still attached to the plants and situated 1–3 cm. below soil level. The fungus appeared to be spreading from some of the seedlings in centrifugal white fans less than 1 cm. below the soil surface. This seems to be the first record of the fungus on *Juglans*. Infection was favoured by the artificial irrigation practised in the nursery and an exceptionally wet season.

44.3 : 12.26–8 : 12.21. PIRONE, P. P., and BENDER, T. R. **Bleeding necrosis of Sweet Gum.** *Shade Tree* 14 (8), 1941 (1–3). [New Jersey Agricultural Exp. Sta.]

The disease is characterized by profuse bleeding from the bark, usually near the butt of the tree but occasionally as high as 20 ft. on the trunk and lower branches. The inner bark beneath the bleeding areas is dark reddish-brown with an occasional pocket containing a white, crystal-like solid; in advanced stages the sapwood, and rarely the heartwood, also exhibit a similar discoloration. Dieback of the crowns of affected trees may occur either rapidly or gradually. Discoloration and bleeding appear to be confined to the aerial parts of the trees. The causal fungus is tentatively identified as *Dothiorella berengeriana* or a closely related species. The known areas of infection are around Roselle Park and Moorestown, New Jersey, and New Brighton and Great Kills, Staten Island. No control measures have as yet been developed.

44.3 : 12.26–8. CARTER, J. C. **Preliminary investigation of Oak diseases in Illinois.** *Ill. nat. Hist. Surv. Bull.* 21, 1941 (195–230).

Descriptions are included of 22 species of fungi that are associated with cankers, deep wood infections, dieback, and twig blight of Oaks in Illinois. The fungi most frequently associated with Oak diseases were *Dothiorella quercina* (Cke. & Ell.) Sacc. and *Coryneum kunzei* Corda, and inoculation trials were made with these two species. Black, Red and White Oaks inoculated with *D. quercina* became infected and showed canker and dieback symptoms typical of those described for *Dothiorella* canker and dieback. The fungus was reisolated in culture from the inoculated Oaks. Two out of three White Oaks inoculated with *C. kunzei* died within a month of inoculation, but the fungus could not be reisolated from them; the third tree showed no symptoms of infection at the end of 21 months.

44.3 : 12.26–8 : 12.21. CONNERS, I. L., MCCALLUM, A. W., and BIER, J. E. **Willow blight in British Columbia.** *Phytopathology* 31, 1941 (1056–8).

The first record of Willow blight on the Pacific Coast comes from Abbotsford, British Columbia, where a tree and several smaller specimens propagated from it by cuttings were found to be infected. Scouting in Abbotsford and its vicinity, in the lower Fraser River valley, and about Victoria on Vancouver Island, failed to reveal any further cases of disease. The infected trees were destroyed. Comment is made on the remarkably constant association of *Physalospora miyabeana* and *Fusicladium saliciperdum* in all cases of the disease; in the present instance the former fungus was the more conspicuous, though both existed in the affected material.

44.4. *Virus Diseases*

44.4 : 12.26–8 : 13.2. RANGASWAMI, S., and GRIFFITH, A. L. **Demonstration of *Jassus indicus* (Walk.) as a vector of the spike disease of Sandal (*Santalum album* Linn.).** *Indian For.* 67, 1941 (387–94).

J. indicus has been shown to be a vector of

spike disease of Sandal under experimental conditions, 50 per cent. of the Sandal plants used for the experiment developing the disease. The morphological symptoms of spike disease were transmitted to healthy plants by *J. indicus*. Symptoms thus produced were then transmitted to other healthy plants by leaf grafting. One plant has already died and the others are dying.

45. DAMAGE BY ANIMALS

45.1. *Mammals*

45.12. VREELING, L. Wildpaggers in Ponorogo. **[Fences against wild animals in Ponorogo.]** *Tectona* 34, 1941 (461–4). [Du.]

Suitable fences against wild pigs, which are protected game but have caused much damage to agricultural crops on regeneration areas, can be built with thin posts about 1½ m. long, driven so that 1 m. remains above ground and spaced at 60–80 cm., between which are woven Kemlandingan [*Leucaena glauca*] sticks or young Teak thinnings split in two, forming a good fence of the wattle type. The work is largely done free by the agricultural contractors, and cost of materials amounts to only 7–8 guilders per km.

45.3. *Insects*

45.3 (68). NAUDÉ, T. J. **Work on the control of insect pests. Annual report of the Division of Entomology.** *Fmg. S. Afr.* 1940. *Repr.* No. 87. pp. 4. R.A.E. A30 (31–3).

A great improvement was noted in some of the high-veldt Eucalypt plantations most seriously attacked by *Gonipterus scutellatus* Gylh. Pigs continued to effect good control of *Nudaurelia cytherea capensis* Stoll in forests of the western Cape Province. Pyrethrum, derris, and dinitro-*o*-cresol have shown promise in preliminary tests against third- to fifth-instar larvae, while cryolite was good, calcium arsenate fair, and lead arsenate and calcium fluoride fairly good. *Pinus patula* was heavily infested by *Euproctis terminalis* Wlk. over about 1,000 acres at Jessievale; in dusting experiments dinitro-*o*-cresol was promising and lead arsenate good against this species. *P. patula* and *Acacia mollissima* were severely attacked over about 5,000 acres by a species of *Colasposoma*, possibly *C. fulgidum* Lef. Application of creosote to the lesions gave excellent results against *Teragra guttifera* Hmps. on Poplar. A dust containing 5–10 per cent. of pyrethrum, applied at 10 lb. per acre, was satisfactory against *Bythoscopus cedaranus* Naudé on Acacia.

45.3 (944). **Insect pests.** *Agric. Gaz. N.S.W.* 52, 1941 (95–9, 116). R.A.E. A29 (608).

Notes are included on *Trogodendron fasciculatum* Schreibers, which is of considerable importance as a predator of lepidopterous and longicorn larvae that bore in trees. *Hylesinus fici* Lea, an indigenous beetle that mines in the terminal branchlets of cultivated and native species of *Ficus*, has been stated to attack the bark and wood of the trees as well. Infestation is seldom detected until most of the damage has occurred, but infested twigs may be cut off and burnt and the trunk and branches might be protected with a repellent paint of copper sulphate.

45.3 : 12.25 : 13.2. TAMANUKI, K. **Injuries of *Picea* and *Abies* caused by Scolytids after storm damage.** *Ōyō Kontyū* 2, 1940 (261–3). [Jap.] R.A.E. A30 (17).

A typhoon caused serious damage to Spruce and Fir in south-eastern Sakhalin in October, 1936. The trees were subsequently attacked by Scolytids and other beetles; about 50 per cent. were infested in 1937, and attack later became more severe. The species causing most injury were *Ips typographus* f. *japonicus* Niij. on Spruce and *Polygraphus proximus* Bldf. on Fir. The former attacks Spruce trunks of all diameters, has a high rate of reproduction, and is responsible for 80 per cent. of the damage; it prefers open parts of the forest, and infestation begins in such places.

45.3 : 12.25 : 13.2. LAMBERT, R. Les autographes de l'épinette en Québec. **[The *Autographa* moths of Spruce in Quebec.]** *Nat. canad.* 68, 1941 (26–9). [F.] R.A.E. A29 (626).

An account is given of the biology and distinguishing characters of *Autographa alias* Ottolengui, *A. selecta* Wlk., and *A. rectangula* Kby., which are common on Spruce and also attack Fir in Quebec. They are usually kept in check by parasites, of which a species of *Copidosoma* is the most important.

45.3 : 12.25 : 13.2. TILL, D. A *Dreyfusia nüsslini* elöfordulása hazánkban. **[*Dreyfusia nüsslini* in Hungary.]** *Erdész. Lap.* 80, 1941 (351–8). [Hu.g.f.e.]

From the author's observations in the Kassa town forest it appears that severe frost in

winter and cool rainy weather in summer tend to check the multiplication of this insect.

45.3 : 12.25 : 13.2. INOUYE, M. **On the control of *Adelges japonicus* Monzen.** *Circ. Hokkaido For. Exp. Sta.* No. 24, 1940. pp. 68. [Jap.] R.A.E. A30 (14).

Descriptions are given of all stages of *Chermes* (*Adelges*) *japonicus*, which is very injurious to species of Spruce in Hokkaido, together with an account of its bionomics. Vigorous and fast-growing trees are less attacked. Effective control of the overwintered nymphs is given by spraying in spring with emulsions of petroleum oil, with or without pyrethrum, or of fish oil, or with a resin wash. Spring eggs are less resistant to insecticides than the autumn ones.

45.3 : 12.25 : 13.2. GÄBLER, H. Nadelmassen und kritische Eizahlen der Nonne für Fichte und Kiefer. **[Quantities of foliage and critical numbers of nun-moth eggs for Norway Spruce and Scots Pine.]** *Forstwiss. Cbl.* 63, 1941 (172–9, 208–14). [G.g.] [Forschungsstelle für Nonnenbekämpfung der Sächs. Forstl. Versuchsanstalt Tharandt.]

Taking data from the literature and his own determinations on the weight of foliage of Pine and Spruce, respectively, and dividing these weights by the weight of needles consumed by a nun-moth larva in the course of its development, the writer calculates the number of eggs which would lead eventually to the complete defoliation of a given Pine or Spruce tree, provided all the larvae reached the pupal stage.

45.3 : 12.25 : 13.2. MCDANIEL, E. I. **Spraying to control *Rhyacionia buoliana*.** *J. econ. Ent.* 34, 1941 (125). R.A.E. A29 (563).

Preliminary experiments in 1940 showed that a fixed-nicotine spray consisting of 3 lb. of Black Leaf 155 (14 per cent.) with 1 U.S. quart of Dendrol dormant oil in 100 U.S. gal. of water gave effective control of *Rhyacionia buoliana* Schiff. on Pine. Under Michigan conditions two applications, made at about 30th June and 8–10th July, were necessary.

45.3 : 12.25 : 13.2 (79.4). MILLER, J. M., SALMAN, K. A., and JOHNSON, P. C. **Bark beetle hazards in the Pine stands of northeastern California. Part I—Purpose, accomplishments, and recommendations of the Forest Insect Hazard Inventory.** Bureau of Entomology & Plant Quarantine, U.S.D.A., Washington, D.C. 1941. pp. 15 + map.

The Forest Insect Hazard Inventory of the Eastside Pine Region of California was begun in 1937 and completed in about 4 years at a cost of some $47,700. During this period about 2,500,000 acres, of which nearly 2,000,000 acres were under virgin Pine stands, were sampled by strip cruises that covered 0·6 per cent. of the area but were selectively located to take in a higher proportion of the more important stands, and stands were rated in 5 hazard classes based on severity of past beetle losses and volume of high-risk trees in the residual green stand. The region has a total living stand of Ponderosa and Jeffrey Pine of over 20 billion bd. ft., with over 8·5 billion bd. ft. of other species, chiefly Sugar and Lodgepole Pine, Incense Cedar, and White Fir. Losses of 3-needle Pine have amounted to more than 4 billion bd. ft., i.e. over 2,400 bd. ft. per acre or 17·4 per cent. of the original stand. The volume of high-risk 3-needle Pine trees is over 3 billion bd. ft., i.e. over 1,800 bd. ft. per acre or 15·8 per cent. of the residual stand.

The region is classified by area and percentage of total Pine volume according to hazard rating, the ratings being very low, low, moderate, high, and very high, and practical control measures are recommended for each condition. These measures consist in liquidation of the stand, direct control by the 'cut-and-burn' method, or light, selective, sanitation-salvage cuttings; all three methods have a place in management. A map is appended to show the regional hazard conditions. [Part II of this report, which describes the methods used and basic data obtained for specific areas, has not been available for abstracting.]

45.3 : 12.25 : 13.2. WEST, A. S. **Biological notes on two species of *Melanophila*.** *J. econ. Ent.* 34, 1941 (43–5). R.A.E. A29 (551–2).

Recent investigations on *Melanophila gentilis* Lec. and *M. californica* Van Dyke in *Pinus ponderosa* and *P. jeffreyi* in north-eastern California have revealed striking differences in the larval development of the two species. The larvae cannot be separated morphologically but can be distinguished in the field by the appearance of their galleries. Larvae of *M. gentilis*, which has a life cycle of one year, develop rapidly in dead or dying material, chiefly slash and windfalls. The young larvae form small galleries in the cambial region, causing no mechanical injury to the wood, and then feed outwards through the phloem. Those of *M.*

californica, which has a life cycle of 2–5 years, pass through an incipient stage of slow growth in living wood for 1–4 years. Galleries are formed that heal over as long as the tree is alive, both wood and phloem being injured. Eggs are also laid in slash and windfalls, but larvae from these do not survive the winter. A phase of rapid larval growth, corresponding to that of *M. gentilis*, with the formation of typical galleries in the phloem, is associated with the death of the wood as a result of logging, windfall, attack by other insects, or other environmental disturbances. It is therefore possible for adults of both species to emerge from a single piece of material during one season. Incipient attacks by *M. californica* are usually relatively unsuccessful in vigorous trees, but more abundant broods of larvae of varying age are common in weaker trees.

45.3 : 12.25 : 13.2. MIAO, C. P. **Study of some forest insects of Nanking and its vicinity. Part IV. Observations on the Pine moth (*Dendrolimus punctatus* Walker).** *Contr. biol. Lab. Sci. Soc. China* (Zool.) 15, 1940 (1–16). R.A.E. A29 (544–5).

Descriptions are given of all stages of *D. punctatus*, which causes serious injury to *Pinus massoniana* and also attacks *P. thunbergii* in the Nanking district.

45.3 : 12.25. DELEON, D. **Notes on some forests insects found in *Pinus occidentalis* Swartz near Jarabacoa, Dominican Republic.** *Carib. For.* 3, 1941–42 (42–5). [E. span.] [Bureau of Entomology & Plant Quarantine, U.S.D.A.]

Annotated list of insects, chiefly Scolytidae and other Coleoptera, collected in a logging area.

45.3 : 12.25 : 13.2. SCHIMITSCHEK, E. Die Übervermehrung von *Diprion pini* L. im westslovakischen Kieferngebiet. **[The outbreak of *Diprion pini* L. in the western Slovakian Pine region.]** *Z. PflKrankh.* 51, 1941 (257–78). [G.] R.M.I.

45.3 : 12.25 : 13.2. THALENHORST, W. Zur Prognose des Schadauftretens der Kiefernbuschhornblattwespe (*Diprion pini* L.). **[On the forecasting of outbreaks of the Pine sawfly (*Diprion pini* L.).]** *Z. Forst- u. Jagdw.* 73, 1941 (201–46). [G.g.] [Institut für Waldschutz, Eberswalde.]

A method of forecasting is outlined, based on investigations during the 1939–40 outbreak in Potsdam and other Prussian districts.

45.3 : 12.25 : 13.2 : 13.15. GÖSSWALD, K. Unterschiede im Jagdinstinkt bei den Waldameisenrassen. **[Differences in the hunting instinct in races of wood ants.]** *Forstwiss. Cbl.* 63, 1941 (139–43). [G.]

From the writer's observations it appears that the larvae of *Diprion pini* are violently attacked by *Formica rufa rufo-pratensis minor*, less so by *Formica rufa rufo-pratensis major*, little by *Formica rufa rufa*, and not at all by *Formica rufa pratensis*. All the above ants attack larvae of *Bupalus piniarius*.

45.3 : 12.25 : 13.2. SCHIMITSCHEK, E. Die Massenvermehrung des Kiefernspanners, *Bupalus piniarius* L., und seine Bekämpfung im Jahre 1940 in der Westslovakei. **[The outbreak of the Pine looper moth, *Bupalus piniarius*, and its control in 1940 in western Slovakia.]** *Cbl. gesamte Forstw.* 67, 1941 (25–46, 53–9). [G.] Biol. Abs. 15 (20080).

The forest studied is 35,000 ha. in extent and is composed of 98 per cent. Scots Pine in even-aged stands with a little Oak understorey. Its character and the warm dry climate favour outbreaks of insect pests. An outbreak of *B. piniarius* began in 1936 and many trees were killed in 1939–40. Of a large number of pupae examined in spring, 1940, 66 per cent. were healthy. They were most numerous and most healthy on the poorest sandy sites. In July and August, 1940, stands were dusted from the air and from the ground with dinitro-*o*-cresol compounds at rates of 50–83 (average about 70) kg. per ha. The poison burned the foliage of Pines that had been defoliated in 1939, as well as that of certain subordinate plants. *Robinia pseudoacacia* was severely burned. Predators and parasites are listed.

45.3 : 12.25 : 13.2 : 43. FURNISS, R. L. **Fire and insects in the Douglas Fir region.** *Circ. Ore. St. Bd. For.* No. 3, 1941, pp. 5. [Bureau of Entomology & Plant Quarantine, U.S.D.A.]

Referring in particular to the Douglas-Fir beetle (*Dendroctonus pseudotsugae*), it is concluded that the burning of the underbrush in a wood is not an effective means of control, but that, on the contrary, fire will bring about conditions favourable to the increase of the insect.

45.3 : 12.25 : 13.2. FURNISS, R. L., and DOWDEN, P. B. **Western Hemlock sawfly, *Neodiprion tsugae* Middleton, and its**

parasites in Oregon. *J. econ. Ent.* 34, 1941 (46–52). R.A.E. A29 (552).

Stands of *Tsuga heterophylla* near Sweet Home, Oregon, were seriously defoliated by *Neodiprion tsugae* Middleton during 1933–36. Since the larvae feed chiefly on old foliage, few trees died. There is one generation a year in Oregon. Adults emerge and deposit eggs in Hemlock needles in early autumn; the eggs hatch early in the following July; and the larvae spin their cocoons in August or September. Most of the cocoons are spun in the forest litter, but a few are fastened to foliage. A small proportion of the population overwinters as prepupal larvae in cocoons. During 1935 and 1936 large numbers of cocoons were collected for rearing; in both collections parasites emerged from about 39 per cent. of the cocoons, but dissection of cocoons in 1936 showed that about 61 per cent. of the sawfly larvae had been killed by parasites. A list is given of the 20 species of primary parasites and hyper-parasites that emerged, with brief notes on the bionomics of most of them.

45.3 : 12.26–8 : 13.2 : 13.15. DOWDEN, P. B. **Parasites of the Birch leaf-mining sawfly (*Phyllotoma nemorata*).** *Tech. Bull. U.S. Dep. Agric.* No. 757, 1941. pp. 55. [Bureau of Entomology & Plant Quarantine, U.S.D.A.]

P. nemorata became abundant in Maine in 1926 and is still plentiful in a number of areas. It is attacked by several native species of parasites, and birds are important at times as predators. About 20 species of parasites have been reared from European material, but only 5 of these—*Phanomeris phyllotomae* Mues., *Chrysocharis laricinellae* (Ratz.), *Epiurus foliae* (Cush.), *Tranosema pedella* (Hlmgr.) and *Chrysocharis* sp.—were liberated in the United States. The first two species were the most important parasites in the European material and together made up about 72 per cent. of the parasites reared; they have become established and have been recovered in small numbers at several liberation points in Maine. The bulk of the paper is devoted to detailed studies of the biology and immature stages of 12 species of parasites comprising the 5 species already named and *Agrothereutes pygoleucus* (Grav.), *Sympiesis* sp., *Pnigalio cruciatus* (Ratz.), *Tetrastichus xanthops* (Ratz.), *Hemiptarsenus anementus* (Walk.), *Cirrospilus pictus* (Nees.), and *C. vittatus* (Walk.).

45.3 : 12.26–8 : 13.2. BEAULNE, J.-I. Insectes coleoptères nuisibles à certains feuillus et conifères. **[Coleopterous pests of certain hardwoods and conifers.]** *Nat. canad.* 68, 1941 (177–91). L.S.

An annotated list is given of 95 species of Coleoptera that attack the Canadian species of Hickory, *Carya cordiformis*, *C. ovata*, *C. alba*, and *C. glabra*.

45.3 : 12.26–8 : 13.2. KAWADA, A., and SUENAGA, H. **On the Chestnut bark miner, *Acrocercops* sp., 2.** *Ōyō Kontyū* 2, 1940 (240–55). [Jap.] R.A.E. A30 (16).

Descriptions are given of all stages of this species. The larvae mine under the bark of new branches and seem to be sap feeders in the first 3 instars. Pupation occurs under the bark. Eggs are usually laid singly on the growing parts of the branches. Larvae are parasitized by a Brachonid and an Ichneumonid, pupae by a species of *Pachyneuron*, and both stages by a fungus. Spraying with lead arsenate, calcium arsenate, and nicotine sulphate or pyrethrum and soap is recommended for control.

45.3 : 12.26–8. PARKER, R. L. **Insects which attack the Redbud.** *Bienn. Rep. Kans. hort. Soc.* 45, 1940 (239–42). R.A.E. A29 (635).

Cercis canadensis is not usually much damaged by insects, but was seriously injured in Kansas during the drought years of 1933–38 by *Fascista* (*Gelechia*) *cercerisella* Chamb. and *Chrysobothris femorata* Ol., all stages of which are briefly described. Other insects observed on *C. canadensis* are a Jassid and an Aleurodid that attack the leaves, and *Aphis pawneepae* Hottes, which has caused considerable damage when infesting the roots. Notes are included on control measures and on means of maintaining the vigour of the trees.

45.3 : 12.26–8 : 13.2 : 13.15. DUMBLETON, L. J. **Australian parasites of *Eriococcus coriaceus* Maskell.** *N.Z. J. Sci. Tech.* (A) 22, 1941 (102A–108A). R.A.E. A29 (545).

A brief review is made of the attempted introduction into New Zealand of predacious insects for the control of *Eriococcus coriaceus* Mask., which is a pest of *Eucalyptus* spp., particularly *E. globulus*. Of the four species recently introduced, only two—*Stathmopoda melanochra* Meyr. and *Pseudoleucopis benefica* Mall—have been liberated, and it is not known whether they have become established. An account is given of *P. benefica* and of its life

history in Australia, and notes are included on other Australian natural enemies of *E. coriaceus*.

45.3 : 12.26–8. INOUYE, M. **On insect pests in forests of *Fraxinus mandshurica* and methods of controlling them.** *Circ. Hokkaido For. Exp. Sta.* No. 25, 1940. pp. 26. [Jap.] R.A.E. A30 (14).

Stereonychus thoracicus Faust attacks *F. mandshurica* in forests in Hokkaido. The larvae feed only on the lower surfaces of the leaves, but the adult weevils also attack the basal parts of the leaf stalks and the new buds. Sixty-seven per cent. of the pupae are parasitized by *Microcryptus sapporensis* Uch., and a fungus. The weevils drop to the ground when disturbed and can then be collected and destroyed. Spraying with calcium or lead arsenate is recommended against the larvae. An aphid, *Prociphilus oriens* Mordv. causes injury to the trees in spring. The infested leaves curl in May and June, and shoot growth is retarded. Recommended control measures are the collection of infested leaves and spraying against the young aphids in spring. Larvae of *Margaronia* (*Glyphodes*) *nigropunctalis* Brem. sometimes defoliate *F. mandshurica*; collecting the larvae and spraying with lead arsenate are effective control measures. All stages of these 3 pests are described.

45.3 : 12.26–8 : 13.2. DAVIAULT, L. La chrysoméle du saule *Calligrapha multipunctata* var. *bigsbyana* Kby. **[The Chrysomelid beetle of Willow, *Calligrapha multipunctata* var. *bigsbyana* Kby.]** *Nat. canad.* 68, 1941 (57–81, 89–112). [F.] R.A.E. A29 (626).

All stages of this beetle are described and an account is given of field and laboratory observations on its bionomics, carried out in Quebec in 1935–7. Larvae develop exclusively on Willow, with a marked preference for *Salix bebbiana*, but the adults occur on Poplar, Aspen, and many other plants. The damage is seldom serious, but in 1934 and 1935 considerable injury was done to ornamental Willows and in forest nurseries. The most important factor in natural control of the Chrysomelid is the weather, and in 1936 the population was much reduced by exceptionally cold and rainy periods.

45.3 : 12.26–8 : 13.2. MAHEUX, G. Le liparis du saule (*Stilpnotia salicis* L.) dans Québec. **[The Willow Liparid moth (*Stilpnotia salicis* L.) in Quebec.]** *Nat. canad.* 67, 1940 (73–8). [F.] R.A.E. A29 (626).

This moth was first observed in Quebec on the Îles de la Madeleine in summer, 1937, when it defoliated Poplars and Willows. In 1938 it spread to the mainland and was taken in several localities round the city of Quebec. It is feared that it may become a pest of major importance unless steps are taken for its control.

45.3 : 12.26–8 : 13.2. HORIUCHI, R. **Observations on *Gypsonoma minutana* Hübner (Eucosmidae).** *Nojikairyoshiryo Minist. Agric. Japan* No. 152, 1940 (86–8). [Jap.] R.A.E. A30 (13).

Notes on the life history of *Enarmonia* (*Gypsonoma*) *minutana* Hb., the larvae of which feed on leaves of Willows and Poplars near Yokohama.

45.3 : 12.26–3 : 13.2. PECHUMAN, L. L. **Notes on the feeding and breeding habits of *Saperda tridentata* Oliv.** *Bull. Brooklyn ent. Soc.* 35, 1940 (113–6). R.A.E. A29 (627).

An account of observations on the bionomics of *S. tridentata* on Elm in south-eastern New York. Newly cut logs and weakened trees are particularly susceptible, and though symptoms of weakening may not be externally apparent, it is thought probable that no entirely healthy tree is attacked. The first sign of infestation in apparently healthy trees is the thinning of the foliage, followed by the dying off of a branch or two.

45.3 : 12.26–8 : 13.2. HOFFMANN, C. H. **Biological observations on *Xylosandrus germanus* (Bldfd.)** *J. econ. Ent.* 34, 1941 (38–42). R.A.E. A29 (550–1).

An account is given of studies in New Jersey on the bionomics of *Xyleborus* (*Xylosandrus*) *germanus* Bldf., which has been observed to breed in Elm in the United States and is suspected of being a vector of the Dutch Elm disease fungus. The beetle usually attacks unhealthy and weakened trees, wind-broken branches, logs, and stumps, the heaviest infestation occurring in partly submerged branches and in roots of stumps in moist situations, though two cases of attacks on healthy trees in heavily infested localities are recorded. It has been found in Elm in New York, New Jersey, West Virginia, and Ohio, and also in Oak, Red Maple, Beech, and Hickory in New Jersey. Breeding habits and other details of life history are discussed. Attempts to infest material artificially were unsuccessful; moisture did not appear to be the only factor necessary for breeding, and it is possible that the wood must be in a certain

condition of fermentation. There appear to be two annual generations or possibly three in New Jersey.

45.3 : 13.2. Ossowski, L. **The cockchafer and methods of defence against it.** *Quart. J. For.* 35, 1941 (147–50).

45.3 : 13.2 (74). Korstian, C. F., and Ruggles, A. G. **Report of findings and recommendations with reference to the Gypsy Moth Project of the Bureau of Entomology and Plant Quarantine.**—With comments by W. G. Howard. *J. For.* 39, 1941 (973–9). [Duke University and University of Minnesota.]

This report is based on a study of the gypsy moth (*Lymantria dispar*) situation in the north-eastern United States and of the work that is being done to control this insect. While spraying is the best method of direct control in infested areas, its use is limited to street, roadside and park trees when applied from the ground. The extended use of the autogiro should increase the area of forest that can be treated in this way. It is suggested that more use should be made of the silvicultural method of control—that is by reducing the favoured-food tree species—and that work on creosoting egg clusters could be reduced or dropped entirely. Furthermore, it is suggested that within the barrier zone control work should be concentrated in the southern part of the zone where conditions are far more favourable to the development and spread of the gypsy moth than they are in the north. Further research should be undertaken on gypsy-moth problems, particularly on the ecology of the insect, new insecticides and other factors of control.

45.3 : 13.2. Baker, W. L. **Effect of gypsy moth defoliation on certain forest trees.** *J. For.* 39, 1941 (1017–22). [Bureau of Entomology & Plant Quarantine, U.S.D.A.]

To determine economic injury by the gypsy moth to forest trees in the New England States, records of defoliation, death of trees and loss of diameter increment were collected from trees in a wide series of plots from 1912 to 1921. Data from the Oaks and White Pine—species suffering greatest economic injury—show that an increase in average defoliation was associated in general with an increase in mortality. Growth and defoliation data of four species of Oaks and White Pine show a direct correlation between percentage of defoliation and decline in radial increment. Diameter growth of Black, White and Scarlet Oaks was found to fluctuate inversely with per cent. of defoliation the same year defoliation occurred. In young White Pines defoliated only once there was direct correlation between per cent. of defoliation and per cent. of trees dying during the following nine-year period.

45.3 : 13.2. Nolte, H.-W. Neue Erfahrungen zur Dykschen Nonnenanlockmethode. [**New experiences with Dyk's method of luring nun-moths.**] *Cbl. gesamte Forstw.* 66, 1940 (197–206). [G.] R.M.I.

45.3 : 21.61. Saito, K. **A contribution to dendro-entomology.** *Bull. Agric. For. Coll. Korea* No. 6, 1941. pp. 272. [Jap.g.] R.A.E. A30 (14).

A detailed account, based on literature and original observations, of the effects of insect pests upon the shape of trees.

45.3 : 23.27 (78.1). Dean, G. A. **Report of the State Entomologist. Some insects causing injury to shade trees in 1939.** *Bienn. Rep. Kans. hort. Soc.* 45, 1940 (169–72). R.A.E. A29 (632).

Three sprayings with 1 pint of nicotine sulphate, 2 quarts of winter or summer spray oil and 100 gal. of water, applied about 31st May, 1st July, and 14th August, gave excellent control of *Cryptaspidiotus shastae* Coleman on *Juniperus virginiana* and did not injure the trees; where infestation was severe, a fourth spraying was made in mid-September. Satisfactory control of *Fascista* (*Gelechia*) *cercerisella* Chamb. on *Cercis canadensis* was obtained with sprays of 3 lb. of lead arsenate and 2 quarts of summer oil in 100 gal. of water, applied in April and May. Good control of *Melasoma lineatopunctata* Forst. (*Lina scripta* F.) on Willows and Poplars was obtained with a spray of 4 lb. of lead arsenate and 2 quarts of summer oil per 100 gal. of water. Notes are included on the biology of these insects.

47. COLLECTIVE INJURIES TO INDIVIDUAL TREE SPECIES

47 : 21.61. Härdtl, H. Beobachtungen an Zwieselbildungen bei Bäumen. [**Observations on forking and fusion in trees.**] *Thar. forstl. Jb.* 92, 1941 (397–447). [G.g.]

Various types of forking of the stem in conifers and broadleaved trees and of fusion of two conifer trees are described with numerous illustrated examples. The causes of forking

and fusion and methods of minimizing the damage are discussed. The elimination of a fork by sawing off one of the stems is a delicate operation, notably in older trees, and often it is preferable to remove the forked tree altogether.

5. MENSURATION. INCREMENT. YIELD

52. MEASUREMENT OF TREES AND TIMBER

52.3. *Form Classes. Form Factors. Taper*

52.3. EMMER, R. E. **A simple method of estimating a taper value for a section of the stem of a tree.** *J. For.* 39, 1941 (1035). [Central States Forest Exp. Sta.]

The taper value in inches per foot for a section of tree stem is shown as the difference between the two end diameters of the section in inches divided by double the length of the section, in feet.

52.4. *Measurement of Volume*

52.4 : 52.2. DAVEY, R. **Timber point.** *Emp. For. J.* 20, 1941 (175–7).

Under the British system of timber measurement the height is taken to a timber point directly related to the commercial uses of the timber. In hardwoods the height will depend on tree form and to some extent on price, and will include butt, butt and top, or butt, second length and top. For the more tapering conifers it is suggested the current practice results in a top quarter girth over bark equal to one-third of the same dimension at 5 ft.

52.43.3 : 12.25 : 12.26–8. JOHNSON, F. A., and CRAWMER, J. R. *Tech. Note cent. St. For. Exp. Sta.* Nos. 35, 36, 37, 1941.

Volume tables for Eastern White Pine (*Pinus strobus*), Eastern Hemlock (*Tsuga canadensis*), and Black Gum (*Nyssa sylvatica*) in Holmes County, Ohio.

52.43.3 : 12.25 : 12.26–8. EMMER, R. E. *Tech. Note cent. St. For. Exp. Sta.* Nos. 39, 40, 41, 42, 43, 44, 46, 47, 48, 50, 1941.

Volume tables for Chestnut Oak (*Quercus montana*); Slippery Elm (*Ulmus fulva*); Shagbark, Pignut, and Bitternut Hickories (*Hicoria ovata, H. glabra,* and *H. cordiformis*); Shortleaf Pine (*Pinus echinata*); Pitch Pine (*P. rigida*); Virginia Pine (*P. virginiana*); Sugar Maple (*Acer saccharum*); American Sycamore (*Platanus occidentalis*; Black Cherry (*Prunus serotina*); and Pin Oak (*Quercus palustris*) in various counties of Ohio.

52.43.3 : 12.26–8. KELLOGG, L. F., EMMER, R. E., and DENUYL, D. **Volume table for Black Maple and Sugar Maple (*Acer nigrum* and *Acer saccharum*), Marshall County, Indiana.** *Tech. Note cent. St. For. Exp. Sta.* No. 51, 1941. p. 1.

52.43.3 : 12.26–8. EMMER, R. E., CRAWMER, J. R., and SCHRAMM, W. O. **Volume table for American Beech (*Fagus grandifolia*), Franklin, Stark and Holmes Counties, Ohio.** *Tech. Note cent. St. For. Exp. Sta.* No. 45, 1941. pp. 2.

52.43.3 : 12.26–8. EMMER, R. E., and SCHRAMM, W. O. **Volume table for Northern Red and Scarlet Oaks (*Quercus borealis* and *Q. coccinea*), Franklin County, Ohio.** *Tech. Note cent. St. For. Exp. Sta.* No. 53, 1941. pp. 2.

52.43.3 : 12.26–8. EMMER, R. E., and CRAWMER, J. R. **Volume table for Black Oak (*Quercus velutina*), Holmes County, Ohio.** *Tech. Note cent. St. For. Exp. Sta.* No. 52, 1941. pp. 2.

52.43.3 : 33.02 : 12.26–8 : 22.88.2. OSTROM, C. E. **Pulpwood volume tables for second growth Black Cherry, Sugar Maple, and Beech in northwestern Pennsylvania.** *Tech. Note Allegh. For. Exp. Sta.* No. 30, 1940. pp. 2.

53. SOLID CONTENTS OF STACKED MATERIALS. REDUCING FACTORS

53 : 33.06 : 12.26–8. BAUDENDISTEL, M. E. **Cordwood converting factor for scrub Oak.** *Pulp Paper Mag. Can.* 42, 1941 (678, 680). [U.S. Forest Service, New Orleans, La.]

Close utilization of this species for fuelwood near Fort Worth, Texas, allows a minimum diameter of 1½ in. outside bark, using both branchwood and stemwood, and on the average there is 70 cu. ft. of solid material in a standard cord (128 cu. ft.) of such material.

56. INCREMENT

56.02 : 11.21 : 09.2. DOUGLASS, A. E. **Cross-dating in dendrochronology.** *J. For.* 39, 1941 (825–31). [Laboratory of Tree-Ring Research, University of Arizona.]

Crossdating as used in tree-ring investigations in the south-western United States is defined as 'finding in many different trees the same relative chronological placement of years of deficient growth'. It has particular application where site conditions are such that direct precipitation is the significant factor in determining tree growth. The method used in crossdating is explained and the principles of interpretation and application that have been developed for the purpose of standardizing the procedure are listed.

56.02 : 11.21 : 09.2 : 12.11.23. GLOCK, W. S. **Growth rings and climate.** *Bot. Rev.* 7, 1941 (649–713). [Texas Technological College.]

A comprehensive and critical review of numerous papers on this subject, with particular reference to recent publications on 'tree-ring analysis'. The general conclusion reached is that the deduction of climatic conditions from tree growth should follow lines other than the direct quantitative attempts to base amount of rainfall on width of growth layers, although in certain instances this method may be effective. There is as yet a dearth of knowledge derived from experimental evidence of the probably complex relations between environment, physiological functioning, and anatomical response; and it is by studies in this field that soil-moisture conditions and, indirectly, rainfall conditions, may eventually prove to be deducible from characters of the growth layers and their cellular structure. There is a bibliography of 203 references.

56.02 : 11.21 : 66. ORDING, A. Den forstlige betydning av vekstklimaets variasjoner. **[Forestry significance of variations in the climatic factors affecting growth.]** *Tidsskr. Skogbr.* 49, 1941 (117–25, 157–64, 198–204). [Nor.] Biol. Abs. 15 (22608).

The effect of climatic variations on increment is discussed. It is suggested that correction for such effects should be made when appraising the results of drainage and other silvicultural treatment, especially where the cut is determined by the 'méthode du contrôle' or where it is to equal the increment.

56.05 : 12.25. KELLOGG, L. F. **Log grade of timber in eastern Ohio. I. Eastern White Pine on Mohican River Gorge, Holmes County, Ohio.** *Tech. Note cent. St. For. Exp. Sta.* No. 38, 1941. pp. 3.

Log grade is shown to vary with tree diameter. The percentages of number 1 logs (12- to 16-ft.) increased from none in 10-in. trees to about 30 per cent. in 18- to 20-in. trees, while the proportion of number 3 logs (lowest grade) dropped from 72 per cent. for 10- and 12-in. trees to about 34 per cent. for 18- and 20-in. trees.

57. DEVELOPMENT AND STRUCTURE OF STANDS. YIELD

57 : 12.25. MCKINNON, A. D. **On Kauri growth and yield.** *N.Z. J. For.* 4, 1940–41 (293–5).

Data are given for Kauri (*Agathis australis*) on the height growth of seedlings and open-grown and sheltered saplings, and on natural seeding and increment.

57 : 12.25. **Douglas Fir and *Pinus insignis* on the Dunster Castle Estate.** *Quart. J. For.* 35, 1941 (153–4).

These trees, planted in the 70's, have shown remarkable growth, as evidenced by the measurements presented.

57.0 : 56.01 : 56.02 : 52.4. ROBERTSON, W. M. **Change in relationship between diameter and height growth.** *For. Chron.* 17, 1941 (162–6). [Dominion Forest Service, Ottawa.]

A comparison of diameter and height measurements made in a Red Pine stand at the beginning and end of a five-year period show that the rate of diameter growth varied from that of height growth for trees in each diameter class and that for the stand as a whole the rate of height growth exceeded that of diameter growth by 2·1 per cent. Such changes in diameter/height relationship should be taken into account when applying diameter/height curves to all remeasurement data, particularly for sample plots.

57.0 : 65 : 22.88 : 12.26–8. STOATE, T. N. **Crown area in irregular forests.** *Aust. For.* 6, 1941 (14–20).

Included are calculations of the approximate number of trees and of the log volumes that may be expected in the different g.b.h. classes of managed irregular Jarrah (*Eucalyptus marginata*) forests on the basis of each of the two hypotheses: (1) that the total crown areas of the different g.b.h. classes are equal; and (2) that these areas vary according to the normal curve of error. The difference between the log volumes of the growing stock as calculated on the basis of these two hypotheses is not very

great, but the distribution of the volume among the g.b.h. classes varies considerably.

57.9 : 22.83 : 12.25 : 22.88.2. WESTVELD, M. **Yield tables for cut-over Spruce-Fir stands in the Northeast.** *Occ. Pap. Ntheast. For. Exp. Sta.* No. 12, 1941. pp. 18.

These tables are for use in mixed Spruce hardwoods areas in the north-eastern United States. Volumes are given for Spruce and Balsam Fir in cords per acre of all trees in and above the 6-in. diameter class for various stand densities and percentages of Spruce and Fir in the stand, and for each of two broad site classes —dominant softwood sites and secondary softwood sites—at 10, 20, 30, 40, and 50 years after cutting and at 60 years for the dominant softwood site. The method for using these tables in predicting growth is described briefly.

6. MANAGEMENT. WORKING PLANS. SURVEYS

60. GENERAL LAND MANAGEMENT

60 (47.2–6) : 24.4 : 11.62.11 : 11.48.2 : 12.11.3 : 12.25 : 21.0. GORSHENIN, N. M. [Editor.] **Results of investigations in 1938 [by the All-Union Research Institute for Rural Melioration with the Aid of Forestry (VNIALMI)].** Goslestekhizdat, Moscow. 1940. pp. 172. [R.r.] C.G.B.

Report on the investigations of the Institute, in various parts of the U.S.S.R., on shelterbelts, the melioration of sands, erosion control, nursery practice, treatment and storage of seed, sowing, mechanization of silvicultural work, forest protection, and the acclimatization and selection of trees.

Narrow shelterbelts, open in their lower part and consisting of only two rows of trees—so-called 'avenue' belts, since the trees are usually planted on either side of a road—were again shown to have a beneficial effect on the distribution of the snow cover and on wind velocity in the adjacent fields. Observations in the Rostov region confirmed the view that on the dry sands there it was advisable to use conifers (*Pinus sylvestris, P. banksiana, Juniperus virginiana,* etc.) in the formation of shelterbelts, and to confine Oak, Poplar, and other broadleaved windbreaks to low ground where ground water is found near the surface of the soil.

1938 was a year of drought, and it was observed that 5-year-old hybrids of Siberian and Japanese Larch were highly drought-resistant. These hybrids are also frost-resistant.

60 (47.2–6) : 24.4 : 11.62.11 : 11.48.2. GORSHENIN, N. W. [Editor.] **Rural melioration with the aid of forestry.** Sel'khozgiz, Moscow. 1941. pp. 392. [R.] C.G.B.

A textbook for technicians dealing with the formation and maintenance of shelterbelts, the control of soil erosion, and the improvement of unproductive sands. The book also contains a summary of useful information on the production of forest seed and on nursery practice.

60 (59.1) : 97.1 : 11.62.11. MANNING, D. E. B. **Some aspects of the problem of *taungyas* in Burma.** *Indian For.* 67, 1941 (502–5).

Continued *taungya* cutting (shifting cultivation) on the same land is known to result in decreasing crop yields and serious erosion, but the growing land hunger in Burma makes it inevitable that more people must turn to hill cultivation as the population increases. There is thus an urgent need for putting such cultivation on a rational basis and for determining the means by which this can be brought about. The two chief requirements are to improve the variety, quality, and yield of the crops—a project on which a start has been made at the A.B.M. Agriculture School at Pyinmana, and to bring the land into a state fit for more permanent cultivation. The latter requirement necessitates some form of ownership of the land if the *taungya* cutter is to be induced to undertake improvement work. A possible solution to this difficulty might be to allow payment of *taungya* tax gradually to build up rights of ownership, and to issue government grants in aid of terracing work and for ploughing cattle. However, the whole case for improved hill cultivation requires facts and figures, which should be collected as soon as possible, before the problem becomes still more urgent.

60 : 34.21. YOUNG, V. A. **A promising new hybrid grass for certain burned-over forest lands.** *J. For.* 39, 1941 (930–4). [University of Idaho.]

Observations indicate that Michels grass, a hybrid, is of value for reseeding burned-over forest areas comparable to those under investigation in Idaho.

60 : 97.3 : 34.21 (79.5). OREGON. **Biennial report of the State Forester to the**

Governor for the biennium of 1939-40. Salem, Ore. [1941?] pp. 59.

A co-operative project has been undertaken by the State Forest Department and livestock interests for the purpose of locating and developing cut-over areas suitable for grazing. In this connexion all forest lands are to be classified as (*a*) chiefly suitable for forest production, (*b*) suitable for joint forest and grazing use, and (*c*) primarily suited for agricultural or grazing development. A guiding principle of this work is that no area be burned preparatory to grazing in excess of grass seed available for sowing, and that no area be seeded in excess of stock available to consume the forage (pp. 33–4).

60 : 43 : 12.19.2 : 12.19.3 : 34.21 : 11.47.2 : 11.62 : 13.2. ELWELL, H. M., DANIEL, H. A., and FENTON, F. A. **The effects of burning pasture and woodland vegetation.** *Exp. Sta. Bull. Okla. agric. Exp. Sta.* No. B-247, 1941. pp. 14. [Conservation Exp. Sta., Guthrie, Okla.]

On scrub Oak land near Guthrie, Oklahoma, the soil and water losses were respectively 12 and 31 times as great on a plot where the litter was burnt annually in early spring as on a plot in undisturbed woodland. In similar experiments on grassland it appeared that burning makes the early spring growth more available and possibly more palatable to livestock, but this advantage is more than offset by a reduction in both quantity and quality of forage produced over a period of years, by destruction of plant nutrients and organic matter, by increased soil and water losses, and by damage to fences and other equipment. It is questionable whether burning has much value in controlling insect pests.

60.1. *Management of Non-Forest Land*

60.1 : 12.19.3 : 11.62.1. HUMPHREY, R. R., and LISTER, P. B. **Native vegetation as a criterion for determining correct range management and run-off characteristics of grazing lands.** *J. For.* 39, 1941 (837–42). [Soil Conservation Service.]

60.1 : 34.21. REID, E. H., and PICKFORD, G. D. **A comparison of the ocular-estimate-by-plot and the stubble-height methods of determining percentage utilization of range grasses.** *J. For.* 39, 1941 (935–41). [Pacific Northwest Forest & Range Exp. Sta.]

60.3. *Management of Different Classes of Forest*

60.31 : 90. GRASER, H. Zum Problem nachhaltiger Produktionssteigerung im Kulturwald der Zukunft. **[On the problem of a sustained increase of production in the cultivated forest of the future.]** *Z. Weltforstwirt.* 1940 (667–98); *abstr.* in *Forstarchiv* 17, 1941 (300). [G.]

Three points are regarded as essential for the development of the best management practice for cultivated forests:—(i) The need for basing treatment of the forest upon knowledge of the particular site, which must be founded upon scientific research and the provision of regional handbooks for forest managers. (ii) The establishment of experimental forests, run on sound scientific and business lines, for long-term investigations. (iii) Reform of local forest administration, involving the relieving of local managers from purely administrative duties in favour of forestry problems proper, and the encouragement of interest and loyalty throughout the local staffs.

60.31.1 (729.9). STEHLÉ, H. Plan d'aménagement et d'exploitation rationnelle de la forêt martiniquaise. **[Plan for the management and rational exploitation of the forests of Martinique.]** *Carib. For.* 3, 1941–42 (32–8). [F.e.span.]

The writer outlines a policy for Martinique forestry. It is estimated that the 8,000 ha. of public forest land in Martinique can produce 40,000 cu. m. of wood annually on a sustained-yield basis. A network of 400 km. of trails has already been marked out and this will serve as the basis for future extraction routes.

60.31.1 : 33.06 : 33.7 (66.9). CATTERALL, R. D. **Ibeju clan fuel scheme.** *Farm & Forest* 2, 1941 (49–50).

The scheme is concerned with the fuelwood species Ikate (*Chrysobalanus ellipticus*) which grows in quaking bogs of freshwater creeks and in poor sandy soils. The area in question is divided into four blocks each of which is to be worked over in 5 years and a fee of 5s. is imposed on every canoe load of firewood leaving the creek.

60.31.2 : 12.19.2 : 12.25 : 22.1 : 23.1. CONKLIN, R. P. **Trends toward improved cutting practices on private lands in the Douglas Fir region.** *J. For.* 39, 1941 (954–6). [Weyerhaeuser Timber Co.]

These include the employment of technical foresters, finding out and using the most suitable silvicultural methods for local conditions, more efficient utilization, improved fire protection, flexible logging plans, and the leaving of logged-over lands in the best possible condition.

60.31.2. MATTOON, W. R. **Forestry and farm income.** *Fmrs'. Bull. U.S. Dep. Agric.* No. 1117, (revised ed.) 1940. pp. 32. [U.S. Forest Service.]

This bulletin presents information on the extent of farm woodlands in the United States, their management and protection, and on the uses, treatment and marketing of woodland products.

60.31.2. **Twelve pointers on farm wood lands.** *Ext. Leafl. Purdue Univ.* No. 225, 1941. pp. 3.

With reference to the protection, improvement, cutting and general management of woodlands.

60.31.2 : 12.25. MATTOON, W. R. **Shortleaf Pine.** *Fmrs'. Bull. U.S. Dep. Agric.* No. 1671, (revised ed.) 1940. pp. 43. [U.S. Forest Service.]

Shortleaf Pine (*P. echinata*) grows rapidly, produces high-quality, soft-textured wood, and readily reproduces itself. It grows well on the uplands from New Jersey south and west to eastern Oklahoma and eastern Texas. This bulletin gives information on the growth, management, exploitation, utilization and both natural and artificial regeneration of this species.

60.31.2 : 94.4 : 35 : 98. PRESTON, J. F. **Marketing the products from farm woodlands.** *J. For.* 39, 1941 (926–9). [Soil Conservation Service.]

The mismanagement of farm woodlots in the past has resulted in their producing mostly low-grade products that are difficult to market. Proper management as a preliminary to successful marketing requires the production of a maximum of high-grade products, for which there is nearly always a buyer. Two requirements in meeting the present marketing problems are (1) a State-wide information service about markets, and (2) the establishment of contact between buyer and seller for the sale possibilities that do exist.

The value of farmers' timber co-operative marketing associations are discussed and conditions needed for their success are noted. Other types of organization suggested for the more effective marketing of woodlot products include a farm association or union rather than a formal co-operative, and co-operation with soil conservation districts.

61. SURVEYING. MAPPING

61.3 : 09.4 (43.9). FÖLDVÁRY, L. Általános idöszaki erdögazdasági összeirás idöszerüsége és lehetöségei. **[The present position and the possibilities of periodical general surveys of forest exploitation in Hungary.]** Hornyánsky Viktor R.-T. Nyomdai Müintezet, Budapest. 1941. pp. 24. [Hu.f.]

A forest survey covering the whole of the present Hungarian territory is planned for 1942. In view of the shortage of qualified personnel within the Forest Service it is suggested that use be made of the services of private graduate foresters and of retired forestry technicians.

61.32 : 52.46. KRUEGER, T. **Use of aerial photos for timber surveys in the Rocky Mountain Region.** *J. For.* 39, 1941 (922–5). [U.S. Forest Service.]

The survey method described is especially adapted to regions where forest types are distinct, and is applied by logging units. The mapper observes type boundaries from vantage points in the field, sometimes checking these by stereoscopic examination of the photos, and draws the type lines on the photos, also locating all survey corners found in the field, roads and trails not otherwise shown, and sample strips for the estimate crew, and also assigns an index number for each merchantable type. After estimating is completed a final map is made on the scale of 4 in. = 1 mile and summaries are made of type area and volume of timber by logging units. The advantages of this method over the ground grid method formerly used in this region include: (i) a more accurate type map, (ii) more usable timber estimates, as they give the volume of individual patches of timber in the logging unit, and (iii) reduced cost of survey.

63. ROTATION

63 : 12.26–8 (922). BECKING, J. H. De omloopstijd voor de djatibosschen op Java. **[The rotation for Teak forests in Java.]** *Tectona* 34, 1941 (507–14). [Du.]

Further discussion of results presented by Hellinga [*For. Abs.* 2 (332–3)]. For reasons of national economy the most desirable rotation for Teak in State forests is that of the maximum

net income, which has been calculated at 125–135 years for fully stocked stands on site qualities 2·5 and 3·5. However, consideration of actual average stocking leads to the conclusion that in practice this rotation would be 90 years for site quality 2·5 and 80–90 years for site quality 3·5 at a final stocking of about 0·64, and these figures are regarded as satisfactory for practical application.

63 : 12.26–8 : 7. DANHOF, G. N. 'Bedrijfsomloop' van den djati. **['Business rotation' of Teak.]** *Tectona* 34, 1941 (779–809). [Du.du.]

It is argued that in actual, as distinct from ideally normal, Teak forests in the Dutch East Indies, the rotation of the highest financial yield is only slightly more profitable than that of the highest income (forest rental).

64. DESCRIPTION OF SITE. ASSESSMENT OF SITE AND STAND QUALITY

64 : 12.19.23 : 2. BRANTSEG, A. Vegetasjonstyper i skogbunnen og deres betydning ved forstlige disposisjoner. **[Vegetation types on forest soil and their significance in forest management.]** *Tidsskr. Skogbr.* 49, 1941 (3–11, 42–50). [Nor.] Biol. Abs. 15 (22585).

The Finnish use of ground vegetation as an indicator of the forest type and its yield capacity is applicable to a fair degree in Norway and Sweden, but not in Germany or where site factors are very variable. In contrast to climax types, the temporary types depend upon microclimatic or stand conditions. Site quality rises with the number of species present. In swamps, the cover species can be used to indicate whether drainage will be profitable. Discreet interpretation of the conditions indicated by ground vegetation may aid in the determination of the appropriate treatment for stands.

66. POSSIBILITY. SUSTAINED YIELD. YIELD REGULATION

66. LEIBUNDGUT, H. À propos des surexploitations; considérations au sujet de leur influence sur la culture forestière. **[On excess cuts; considerations on their influence on forest cultivation.]** *J. for. suisse* 92, 1941 (217–22, 243–7). [F.]

66 : 24. MANTEL, W. End- und Vornutzung. **[Final and intermediate yields.]** *Thar. forstl. Jb.* 92, 1941 (447–62). [G.]

It is argued that official instructions should be elaborated for German public forests fixing the optimum volume of timber to be removed in intermediate yields. This appears desirable in view of the fact that these yields have grown in importance in recent years.

9. FOREST POLICY

90. GENERAL PRINCIPLES OF FOREST POLICY

90 (497.2). SIRAKOV, G. Grundprobleme der bulgarischen Forstwirtschaft. **[Fundamental problems of Bulgarian forestry.]** *Der Bulgarienwart* 1940 (11), (12); *abstr.* in *Forstarchiv* 17, 1941 (212). [G.]

The annual cut is at present about 3·6 million cu. m. solid measure, of which only 25 per cent. is timber. Annual increment per ha. is only 1·7 cu. m. solid measure. About two-thirds of the forest area is under coppice stands. The immediate tasks of Bulgarian forestry are conversion of coppice to high forest, increased cultivation of conifers to replace poor Beech stands, afforestation, development of the forest road system, and torrent-training works.

90 (6 : 97). STEBBING, E. P. **Forestry in Africa.** *Emp. For. J.* 20, 1941 (126–44).

The origin, development and administration of the forest policy in India since 1862 is reviewed briefly and a comparison is made between that and the forestry administration and progress in the African Colonies. The particular points dealt with include:—reservation of forests; stock mapping and enumeration of the growing stock; fire protection, shifting cultivation, erosion; the revenue and expenditure question; education and staff.

90 (74). **Report of Committee on Policy, New England Section, Society of American Foresters. Sectionalism versus professional attitudes.** *J. For.* 39, 1941 (823–4).

90 (79.5) : 66. WATTS, L. F. **Future possibilities of industrial support through timber operations in the Klamath Basin.** *J. For.* 39, 1941 (899–902). [U.S. Forest Service.]

It is pointed out that the high annual cut made in this region of Oregon during the past

15 years cannot continue indefinitely and suggestions are made for public control of cutting practices and changes in the future economy of the community so that its industrial and social life need not be liquidated.

91. SOCIAL AND ECONOMIC SIGNIFICANCE OF THE FOREST

91 (91.4). CRUZ, E. DE LA. **The socio-economic significance of the Philippine forest.** *Philipp. J. For.* 4, 1941 (141–59). [Bureau of Forestry, Philippines.]

Notes on the area, contents, and value of the forests of the Philippines; on timber production, and the public revenue it yields; and on the indirect benefits afforded by the forests of the country.

91.1. *Rural Preservation. Reserves. National Parks. Plant and Animal Protection*

91.1 (78 : 79) : 12.19. BAILEY, H. E. and V. L. **Forests and trees of the western National Parks.** *Conserv. Bull. U.S. Nat. Park Serv.* No. 6, 1941. pp. 129.

A popular descriptive bulletin containing accounts of the trees and forest types encountered in the various National Parks of the western United States and Hawaii. Field guides to the trees are included.

91.1 : 34.3 : 60 : 94.11. MATTOON, M. A. **Co-operative management of wildlife effected by U.S. Forest Service regulation.** *J. For.* 39, 1941 (869). [U.S. Forest Service.]

With reference to a regulation issued by the U.S. Secretary of Agriculture that is concerned with the co-operative management of wildlife on the national forests and with the protection of forest resources from damage by over-populations of game.

91.1 : 60 : 23.2. DEFRANCE, J. A. **Planting of woody plants for food and shelter for wildlife.** *Misc. Publ. Rhode Is. agric. Exp. Sta.* No. 9, 1941. pp. 10.

A short guide for farmers and others interested in bird conservation.

91.7. *The Forest as a Source of Raw Materials*

91.7 (213). DESCH, H. E. **The contribution of tropical forests to war economy.** *Malay. For.* 10, 1941 (123–30).

A general examination of the place of tropical woods in war-time economy, with particular reference to Malaya. It is concluded that the primary role of tropical forests in war is to supply round and sawn timber, and not to provide raw materials for new industries that would divert labour from essential work and probably create post-war problems in addition. The real war-time opportunity for forest utilization in a country such as Malaya lies in extending the uses of local woods for timber and in reasonable expansion of local wood-using industries that have already proved sound under tropical conditions.

92. FOREST LAW

92 (494) : 98 : 33.06 : 33.7. SWITZERLAND. Instructions n° 4 de l'office de guerre pour l'industrie et le travail sur l'approvisionnement de l'industrie des foyers domestiques, des entreprises artisanales et des entreprises de transports en bois de feu. **[Instructions No. 4 of the War Office for industry and labour in the supplying of fuelwood for industry, domestic heating, and artisan and transport firms.]** *J. for. suisse* 92, 1941 (232–5). [F.]

92 (498). VASILIU, V. Legiuirile forestiere şi cele in legătură cu pădurea. **[The forest laws [of Rumania].]** *Rev. Pădurilor* 53, 1941 (368–90). [Rum.f.]

A chronological list of the 146 laws and decrees passed during 1910–40.

92 (71.5). NEW BRUNSWICK. **Schedule of New Brunswick Timber Regulations in effect August 1st, 1941.** *Royal Gazette, New Brunswick* 99, 1941 (126–9).

92 (77.5) : 43.1. **Wisconsin Forest, Field and Marsh Fire Laws, including other Statutes and Conservation Commission Orders relating to Forest Protection.** Wisconsin Conservation Commission, Madison. (Revised ed.) 1940. pp. 56.

92 (79). **Pocket manual on forest laws and practice for the Douglas Fir region.** Joint Committee on Forest Conservation, 364 Stuart Building, Seattle, Wash. 1941. pp. 31.

92 (79.5). OREGON. **Biennial report of the State Forester to the Governor for the biennium of 1939–40.** Salem, Ore. [1941?] pp. 59.

During 1941 sixteen measures, either new acts or amendments of old acts, were passed by

the legislature to provide Oregon with the most progressive code of State forest laws in the United States. These laws were concerned with: (*a*) increased protection of forest lands, (*b*) insurance of regeneration following logging, (*c*) State acquisition of forest lands, and (*d*) the establishment of a State forest research laboratory (pp. 13–4).

92 (79.5). **Oregon Forest Laws 1941.** State Printing Dept., Oregon. [1941.] pp. 119.

92 (79.5) : 66. **The Oregon Forest Conservation Act: An explanation of its purposes and requirements for information of operators and inspectors.** *Circ. Ore. St. Bd. For.* No. 4, 1941. pp. 8.

92 (79.5) : 95.1. **The Oregon Forest Tax Law: The results of ten years of application of the forest fee and yield tax principles.** *Circ. Ore. St. Bd. For.* No. 1, 1940. pp. 12.

92 (79.5) : 95.1 : 23. **The Oregon Forest Fee and Yield Tax Law or Reforestation Act.** *Bull. Ore. St. Bd. For.* No. 6. pp. 48.

92 (92) : 90. FLUYT, P. C. M. Een boschordonnantie voor de Buitengewesten. **[A forest ordinance for the Dutch East Indies exclusive of Java and Madura.]** *Tectona* 34, 1941 (686–708). [Du.] *Repr.* from *Koloniale Studiën* No. 3, 1941.

A discussion of the principles that should be followed in framing forest legislation for the 'Outer Provinces' of the Dutch East Indies, and of the history of an abortive draft forest ordinance considered by the Government in 1936.

92 (922) : 94.11. FLUYT, P. C. M. Het begrip ''s Lands bosschen' in de Boschordonnantie voor Java en Madoera. **[The term ''s Lands bosschen' in the Forest Ordinance of Java and Madura.]** *Tectona* 34, 1941 (448–58). [Du.]

A proposed re-definition of the term ''s Lands bosschen' (State Forests) for legal purposes covered by the Forest Ordinance of Java and Madura.

92 (931). BOARDMAN, W. **New Zealand forest legislation.** *N.Z. J. For.* 4, 1940–41 (328–30).

A synopsis of legislation affecting New Zealand forests [cf. *N.Z. J. For.* 4 (180–6)] is brought up to date to include enactments of 1938, 1939 and 1940.

95. FOREST TAXATION

95.1 : 60.31.2. CRAIG, R. B. **Post-war tax policies and forestry.** *Sth. Lumberm.* 163 (2057), 1941 (223–5). [Southern Forest Exp. Sta.]

With particular reference to the southern United States.

97. POLICY REGARDING THE RELATION OF THE FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY

97.1 (73) : 11 : 11.4 : 23.3. AUTEN, J. T. **A critical discussion of soil classification with special reference to forests.** *Proc. Soil Sci. Soc. Amer. 1940* 5, 1941 (341–3). [Central States Forest Exp. Sta.] H.S.B.

It is concluded that 'a land classification for forests should be preceded by an estimate of agricultural land requirements for at least 50 to 100 years to come. Once the forest land has been roughly delimited, the aim should be eventually to restore the type of forest cover which originally occupied the land. This involves ecological successions and related soil restoration. Land should be classified for forests on the basis of soil properties expressed in terms of capacity to utilise rainfall effectively. Moisture percentages and temperature extremes should be determined by actual measurements. Existing types of vegetation might well be correlated with soil data. Soil type classification should be modified according to geographic location, aspect, slope, and exposure. The types should then be evaluated on the basis of specific properties of the profile in all stages of decadence and recovery'.

97.1 (79.5) : 97.2 : 43 : 60 : 34.21 : 92. LYON, H. **Administrative policy for controlled burning in western Oregon.** *Circ. Ore. St. Bd. For.* No. 2, 1940. pp. 25.

This policy is concerned with the fire-protection requirements of each of the three land-use categories into which cut-over areas in Western Oregon can now be classified—that is as timber-producing, for joint grazing/forest use, or dominantly grazing.

97.1 (922) : 11.6 : 90. DOORN, Z. VAN. Grondverzorging en productieverhooging, een dubbele taak voor het Boschwezen op Java en Madoera. **[Soil conservation and the raising of production: a twofold task for**

the Forest Service in Java and Madura.] *Tectona* 34, 1941 (476–504). [Du.]

The place of forests in the social economy of this region is discussed at some length, and a strong plea is made for better land use. Java has a dense and increasing population that is predominantly agricultural, and the protective rôle of forests in soil and water conservation is probably at least as important to permanent national welfare as is the production of timber. Of the total land area—about 13 million ha.—some 3 million ha. are under forest, 8 million ha. under native agriculture, and 1 million ha. in cultivation by commercial enterprise. This distribution is regarded as fairly well balanced area for area, but much of the land is unfit for its present uses and adjustment will become a pressing need. It is believed that this might be effected, in spite of many difficulties, by reallocation of land on an exchange basis to suitable forms of use. Such exchanges would certainly benefit agriculture, as the most productive forest lands would be exchanged for submarginal land; the loss to forestry could be more than compensated by afforestation and better management of the existing forests, which are capable of producing timber in quantities far greater than the present outturn. The major task of productive forestry—and even protection forests could probably be managed productively—will be to find means of establishing connexion between this great potential outturn of wood and the great potential market offered by the Javanese population, a large section of which is too poor under existing conditions to buy the wood that it needs.

97.1 : 60.31.2 : 94.3 (73). RECKNAGEL, A. B. **Forestry at the cross roads.** *Paper Tr. J.* 113 (14), 1941 (15–6). [New York State College of Agriculture, Cornell University, Ithaca.] P.R.

In the author's opinion, drastic legislative measures giving complete state control are not a desirable means of promoting private forest management in the United States. Better results would probably be achieved if co-operation were encouraged by measures such as those formerly laid down in the Conservation Code under the National Industrial Recovery Act.

97.1 : 60.31.2 : 94.3 (73). PIERCE, W. M. **Forest regulation.** *For. Leaves* 31 (6), 1941 (3, 11–3).

97.1 : 60.31.2 : 94.3 (73). EHRHART, E. O. **Forest regulation—or cooperation?** *For. Leaves* 31 (6), 1941 (5, 15).

97.1 : 60.31.2 : 94.3 (73). REYNOLDS, H. A. **And for other purposes.** *For. Leaves* 31 (6), 1941 (6, 13–5). [Massachusetts Forest & Park Association.]

These three papers discuss means of putting into effect public regulation of private forest management in the United States.

97.1 : 90 : 91 (87). GONZÁLEZ VALE, M. A. La conservación de los recursos naturales: el problema, sus diversas fases y la importancia relativa de éstas. **[The conservation of the natural resources [of Venezuela]: the problem, its various aspects and the relative importance of each.]** *Carib. For.* 2, 1940–41 (174–81); 3, 1941–42 (1–10). [Span.span.e.] [Ministerio de Agricultura y Cría, Caracas, Venezuela.]

The author urges the establishment of an institute of conservation in Venezuela with the main object of conserving the forests of the country.

98. THE TIMBER MARKET

98 (4 : 73). SCHLOMANN, A. F. **The present war and its influence on the wood industry in Europe and the United States.** *Wood Products* 46 (11), 1941 (16, 36).

With particular reference to German forest policy, management, and utilization.

98 (73) : 33.02 : 33.32 : 35. **Hearing before the Committee on Agriculture, House of Representatives, Seventy-seventh Congress, First Session, on H. J. Res. 15: A joint resolution to investigate the apparent monopolistic purchasing of pulpwood by pulp and paper mills under a contract purchase system from farmers and other owners, price fixing of paper and other pulp products under trade practice rules and regulations including cost of distribution.** U.S. Govt. Printing Office, Washington, D.C. 1941. pp. 103.

98 (76) : 3. **Report of Committee on Forest Products Utilization, Ozark Section, Society of American Foresters.** *J. For.* 39, 1941 (994–7).

It is pointed out that the total timber drain in the southern United States, including utilization and loss, is 86 per cent. of the growth and that most of the overproduction is in hardwoods. It is emphasized that wider and

more intense utilization, on a sound economic basis, is a necessary preliminary to better forest practices, and suggestions are made as to possible developments along these lines. An example of this trend is shown by the introduction of the pulpmill in the south, which resulted in the utilization of what was primarily valueless material in the Pine forests and has made possible stand-improvement operations.

98.1 : 33.06 : 33.7 (66.9). NASH, T. A. M. **Fuel consumption in relation to minimum temperature.** *Farm & Forest* 2, 1941 (34–6).

A study of the fuel (mostly wood) consumed in a native village in Nigeria in the course of a year showed that an average of 4·7 lb. was burned per head per day and that there was a very good relationship between monthly fuel consumption and minimum temperature, consumption varying from 2·5 lb. per head per day during the period when the nights are hot, to 6·2 lb. when nights are cold and everyone has a fire under his mud-work bed.

98.3 (73). HAYWARD, P. A. **Lumber—war-time and post-war.** *Sth. Lumberm.* 63 (2057), 1941 (133–40). [U.S. Department of Commerce.]

An analysis is made, for both timber-importing and timber-exporting countries, of present sources of supply, markets and, in general, the restriction on the world timber trade as a result of the war. It is concluded that the only countries with an exportable surplus of timber in Europe after the war will be Sweden and Finland, that this surplus will not do more than meet the import requirements of Central Europe and the Mediterranean area, and that the timber deficit of western Europe will have to be met largely from American sources.

98.3 : 33.17 : 52.43.2 : 76 : 12.25. LODEWICK, J. E. **West Coast log values. I. Douglas-Fir from the Oregon Cascades.** *Products Pap. Pacif. Nthwest. For. & Range Exp. Sta.* No. 3, 1941. pp. 40.

An analysis of the results obtained from a study of Douglas-Fir log values and milling costs made at a mill with a capacity of 100 thousand bd. ft. per 8-hour shift.

NOTES FROM THE DAILY AND THE NON-TECHNICAL PRESS

References: 1. *Angriff*, Berlin. 2. *Berliner Börsen-Zeitung*, Berlin. 3. *Christian Science Monitor*, Boston. 4. *Comércio do Porto*, Oporto. 5. *Deutsche Allgemeine Zeitung*, Berlin. 6. *Diario Ilustrado*, Santiago. 7. *Giornale d'Italia*, Rome. 8. *Imparcial*, Guatemala. 9. *Jornal do Comércio e das Colónias*, Lisbon. 10. *Madrid*, Madrid. 11. *Økonomisk Revue*, Oslo. 12. *Tribuna*, Asuncion. The numbers in brackets indicate the reference number and the date of publication of the newspapers to which the annotations refer.

Chile. The following data are quoted from a recent publication by the Department of Commerce of the Ministry of Foreign Relations:—The wooded area of Chile is estimated at 15½ million ha., of which 4½ million ha. contain 252 million cu. m. of merchantable timber. Present exploitation averages some ¾ million cu. m. annually. The timber industry gives direct employment to 73,000 persons (**6**; 23.9.41).

Germany. An agreement was signed on 23rd January between Germany (including the Occupied Territories), Denmark, Sweden, and Finland for the regulation of timber exports within this block of countries. Special commissions were formed to make suggestions as to the best methods of balancing available timber supplies and requirements, of combining surplus areas with the nearest deficit areas, of developing routes for water transport, of eliminating price movements, etc. (**1**; 24.1.42). The *Deutsche Allgemeine Zeitung* (**5**; 25.1.42) hailed this timber agreement as 'the first practical step in the realization of the New Order', but the *Berliner Börsen-Zeitung* (**2**; 25.1.42) suggested that its fulfilment might not be easy, planning for a whole region of States being inherently difficult. All commentators emphasized that the inclusion of Sweden in the timber agreement was of 'political significance'.

Guatemala. Specimens of 600 home-grown timbers, classified and annotated by officers of the Ministry of Agriculture, were being exhibited at the National Fair (**8**; 20.11.41).

Italy. The Ministry of Agriculture announced on 20th November the formation of a Higher Council for Agriculture and Forestry (Consiglio Superiore dell'Agricultura e delle Foreste). The Council is to supersede the various commissions and technical committees which had been set up from time to time, and is to have a technical character. Its forestry section will supervise the working of the Forestry Militia (**7**; 21.11.41).

The rationing of charcoal and wood used as fuel for motor vehicles was announced as from 1st February. All drivers of vehicles acquiring fuel in greater quantities than those allowed for each type of vehicle will be subject to the Penal Laws and will be disqualified from obtaining further rations. The monthly rations of charcoal and wood for each type of vehicle were fixed as follows: motor-cars, 150 kg. charcoal or 300 kg. wood; lorries up to 15 h.p., 300 kg. charcoal or 600 kg. wood; lorries from 16 to 20 h.p., 350 kg. charcoal or 700 kg. wood; lorries from 20 to 30 h.p., 750 kg. charcoal or 1,500 kg. wood; lorries from 30 to 40 h.p., 2,000 kg. charcoal or 4,000 kg. wood; lorries of over 40 h.p., 4,000 kg. charcoal or 8,000 kg. wood (**7**; 2.1.42).

Norway. *Økonomisk Revue* devotes a whole number to the wood-using industries (**11**; 9.10.41). The early fears of losing export markets for pulp and paper products were exaggerated. The overseas markets were lost in 1940, but the pulp and paper industry formed a central organization which took part in negotiations for new European cartels and also arranged for considerable sales of Norwegian produce to Germany and other countries. The scarcity of fodder has been partly mitigated by the use of cellulose fodder, while the manufacture of this new product has helped the industry to maintain itself. Foreign buyers have shown great interest in rayon pulp and in kraft paper for spinning; several other types of paper also found markets, as did all the mechanical pulp that can be expected to be produced at present. For newsprint there have been few markets so far. Kraft paper is being used in three large Norwegian factories for spinning paper yarn that is further converted into products such as packing thread, ropes, canvas, sacking, and 'linen'. *Statistiske Sentralbyrå* has published the following combined indices for average monthly production of mechanical pulp, cellulose, and paper:—1938: 100; 1939: 110·5; 1940: 75·5. The Norwegian pulp and paper industry, though continuing to earn only low profits, has maintained itself better than that of

Sweden, the Swedish index in June, 1941 being down to 43 (1935 = 100). In Norway the price of cellulose fodder at the factory is 250 kr. per ton, of which the farmers pay only 190 kr., the remainder being provided by a State subsidy (Exchange 1939, Kroner 19·90 = £1); a tax has been recently put on sales of saw timber to cover this subsidy. Pulpwood prices have increased in 1941 but the effect will not be felt by the industry till next year. The industry is hoping to obtain more raw material during the coming season.

Production of sawn timber reached a record figure in 1941, when approximately 400,000 standards (estimate) were manufactured, as against an estimated annual average of just over 200,000 standards during the thirties. This boom allowed many small sawmills that had gone out of business to resume production.

Paraguay. The President of the Department of Lands and Colonization has decreed that from 1st April, 1942, only specified tree species will be allowed to be cut in public forests for the preparation of minor produce such as firewood, charcoal, fencing material, etc. Infringements of this regulation will be punishable by confiscation of the produce. This step was taken to check the prevailing practice of 'inferior utilization' of high-quality timbers (**12**; 30.10.41).

Portugal. The cork industry has been progressing slowly, but on the whole satisfactorily. One main danger has been the production of cork substitute, which is steadily invading the market on account of its lower price. There have been indications that the substitute is getting a hold in the United States, Portugal's principal cork customer (**9**; 11.12.41).

It is suggested that the cork industry has not been utilizing its raw material profitably. During 1939 less than 7 per cent. of the total export of 160,000 tons was worked up, the remainder going to the United States, Britain, and the Dominions, where it was worked up and sold at ten times its import value. Portugal is the second cork-producing country in the Mediterranean and should send operatives abroad to study elaboration methods (**4**; 19.12.41).

Spain. During 1941 public afforestation work has been carried out in 33 provinces. Altogether some 11,000 ha. have been afforested (**10**; 10.1.42).

Tunisia. The most serious shortage in Tunisia is that of fuel. Although there is no manufacturing industry to consume fuel, agriculture is highly mechanized, and both Arabs and whites farm on a large scale. By June, 1941, 300 tractors and lorries had been fitted with gas producers, and it was hoped to fit another 800 by October. Government loans to cover the cost were being extended to farmers (**3**; 7.6.41).

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